VOLUME VIII #4 JUNE 1993 PRICE $6

FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF UNUSUAL SOUND SOURCES

EXPERIMENTAL MUSICAL INSTRUMENTS

WHAT, MORE?

Reinhold Marxhausen makes small, globby-looking metal things. By his deprecatory description, they are unassuming in appearance. But there's *a tiny sound* inside — you can hear it when you hold the object close to your ear — and that's where the magic is. Marxhausen talks about his *Stardust*, and the world from which it comes, in the article starting on page 6 of this issue of **Experimental Musical Instruments**.

IN THIS ISSUE

More good things in this issue:

David Barnes talks about composition using ideas taken from several builders whose instruments have appeared in these pages in the past. His chosen istruments include T. Rodimba (an electroacoustic percussion board), Trash Can Platter (an assembly of pan lids, platters and bicycle wheel set onf a garbage can resonator), Tubulon (steel conduit marimba), and a tuned set of end-struck percussion aerophone tubes.

Ken Peacock uses 3-dimensional sound spectrum charts to illustrate what goes on in complex clarinet multiphonic tones — those sounds in which the clarinet produces an odd mix of non-harmonic pitches, for a most peculiar tone quality.

Dan Senn discusses the work of several sound explorers in Europe and the Unitee States, as he develops his concept of *non-linear instruments*.

Reed Ghazala introduces a new set of truly strange circuit-bent sound devices, based on maniplation of the vocal sound chip used in Texas Instruments' educational toy called "Speak & Spell."

Mike Hovancsek describes Hal Rammel's bowed & plucked idiophone, the Sound Palette.

Last issue's wind instrument toneholes article continues, as Part 2 discusses the practical side of things: techniques for hole making in different materials; how to ensure a leakless seal when the hole is covered; some ideas for home-buildable keys and pads.

And, as usual, we have lots of reviews, and letters, and so forth, and so on. Welcome to another issue of EMI.

Above: Reinhold Marxhausen with sonic headgear. See the article starting on page 6.

Drawing by Robin Goodfellow.

THANKS FOR another great issue of EMI. It is good to see information on the theremin being published, and I hope lotsa folks have fun building and using the digital theremin. However, if they wire it exactly as shown in the schematic, they may silently blow a few chips. Pin 10 of U1 (the 4069) should be pin 9 instead. Pins 9, 11 and 13 are the inputs to unused gates on this IC, and unused inputs should never be left unconnected, or "floating", in a CMOS chip. Pin 10 is an unused output and should be unconnected. CMOS chips are static sensitive, too, and people should take care not to build up static charges when handling them. Avoid wearing synthetic fabrics.

Also, this circuit may produce significant amounts of high frequency sound, which will probable be very annoying when fed to any high fidelity speakers, and can cause noise reduction and bias frequency circuits to do strange things. A simple solution which works for me is to connect a .068 uF capacitor from output to ground. This can be soldered directly to R5 or the output jack.

Phil Krieg

From the editor: EMI received two copies of the schematic in question, one corrected and one not, and, wouldn't you know it, we inadvertantly printed the wrong one. EMI apologizes to anyone for whom the errors caused problems. Thanks to letter writer Phil Krieg for catching the error and providing the corrections.

I CAME ACROSS an interesting toy the other day that I thought was worthy of a little space in EMI. The toy is a plastic tube that has a cap on both ends. Inside the tube is an object that is approximately the size and shape of a "D" battery. This object has holes drilled through it and in each hole is a reed. When a person turns the tube vertically, the object inside drops to the bottom and (since the ends of the tube are capped) the air in the tube is forced across the reeds. When the tube is turned upside-down, the object drops to the other end, thus, forcing air across a second set of reeds.

When a person turns, tilts, and shakes this instrument, it creates a variety of interesting sounds. The speed of descent affects the pitch as does the rhythm of descent (a "wobbling"effect can be achieved when the tube is held and shaken at a semi-vertical angle).

I don't know who manufactures this toy (the version I saw belonged to my little sister who obtained it at a Halloween party) so I have no idea where EMI readers can find them. The design is so clever, however, that I am sure it could inspire some advanced versions from our readers. I imagine that if a whole series of these instruments (each a different size and made of different materials) were set into motion at the same time, it would sound really amazing.

If anyone has any instruments built according to this design (perhaps inspired by this article) I would love to hear from them.

Mike Hovancsek
1889 Algonquin Place
Kent, OH 44240

I HEARTILY WELCOME more space for the reviews section. Our feeling here is that if all periodicals set aside a little space for review and contact information, there would be less dependence on mags like Factsheet Five to get the word around about what's out there.

Have you considered making EMI available on line? It, of course, is even possible to have subscriptions if you didn't want to make it freeware. Of course a major hesitation would be lack of the visuals, but even in text form EMI has much vital information.

Just returned from Minneapolis. While we were there we visited the new fluxus exhibit at the Walker [art museum]. There are many sound-sculptures and interactive sound events (mostly created in the 60s) on display. Too numerous to make an accounting of in this letter. Also in attendance was Yoshi Wada who gave a workshop/demonstration on turning everyday house appliances into an orchestra. It was called "What is wrong with your ears?". He had mixers, washing machine, radio, sander, wind shield wipers, electric fan being turned on and off via an ancient computer. Also many resonant objects like sheet metal, 55 gallon drum and such were struck by solenoid-controlled hammers.

It is interesting to note that Fluxus began as an initiative to get art out of the museums and into the streets to make access to creativity and imagination accessible to all. Well, 30 years later much the same thing that happens to all "movements" is taking place for Fluxus. The historians are trying to embalm it in the cocoon of art history. Yoshi Wada's work which was loud, unpredictable and alive defied the sort of fossilization that is already happening to a lot of the Fluxus history. Because he was there in person, the aura of do it yourself was in the air.

Miekal And

EXPERIMENTAL MUSICAL INSTRUMENTS
Newsletter for the Design, Construction and Enjoyment of Unusual Sound Sources

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SUBMISSIONS: Experimental Musical Instruments welcomes submissions of articles relating to new or unusual musical instruments. A query letter or phone call is suggested before sending articles.

FOLLOWING THE RISE of music-reviewer Mike Hovancsek, I was intrigued by his perfunctory demise. I re-read the letters to the editor looking for the reason. Initially as far as I can tell, Mr. Hovancsek offended Richard Waters and Richard Waters' continued good-will is worth more to EMI than Mike Hovancsek's future reviews. Hovancsek's dismissal from EMI's review section looks nothing more like a chicken-little attempt to soothe somebody's ruffled feathers.

In a stereotypical way I've understood the precision music demands causes some music makers to be extremely intolerant of those who are less precise. I've also imagined that artist/inventors are fearful of criticism of any kind. Put these two groups together and it's a wonder that Mr. Hovancsek's reviews lasted this long.

I've always marveled at the diversity of "musics" represented in EMI; it's the reason I'm a subscriber. The only criticism I have is that some of EMI's articles are so information-heavy, they're as interesting to read as blueprints. I recommend EMI to friends because of its diversity, but always with the warning that it might be too "dry", too technical. Now I wonder if that dryness is actually editorial policy.

Why can't the editors of EMI let Hovancsek take the heat for his aesthetic judgements and other mistakes? The editors needn't be responsible for everything that appears in the newsletter. (In a "we don't agree what you say but we defend your right to say it" kind of way.) Blueprints are important, but so are ideas, feelings and opinions.

I once thought the absence of an interesting letters-to-the editor section in EMI was because space was at a premium. Now that absence looks like policy too. A policy that believes that precision and diversity can only thrive in an environment that allows no controversy.

One could give a few pages to the rants and ravings of EMI readers and one could give a music reviewer a free-hand. Whether EMI would be better for such democratization we many never find out, but doesn't it seem like a pity that EMI will listen to any music except the music of controversy?

John Cieciel

From the editor: To avert possible misconception, I should clarify the situation regarding a couple of subsidiary issues within the larger issues that John Cieciel raises. 1) Richard Waters did not bring any pressure to bear on EMI regarding Mike Hovancsek's reviews. He merely wrote a letter to the editor taking issue with one of the reviews. EMI then gave the reviewer the last word, inviting him to respond to the letter writer's comments, which he did. 2) It's possible that someone reading the last two paragraphs of John Cieciel's letter could come away with the impression that EMI as a matter of policy avoids printing potentially controversial letters. Actually, we pretty much print what we get. See EMI's (somewhat informal) letters policy statement, which I've taken the opportunity to include in this issue at the end of this letters section.

I WANT TO THANK YOU for publishing my letter in EMI. [Peter Hurney's letter, appearing in EMI Volume VIII #3, asked for suggestions for materials for use in making mirliton membranes.] I received some really good response to my inquiries. Some readers sent me their methods of producing thin membranes to make buzzing resonators, with a couple variations of using modelling airplane lacquer, and (quite unexpectedly) I received not just one but two xeroxed copies of McCallum's *Book of the Marimba*, one of which I sent along to another reader who wrote me and asked me if by chance I'd had any luck locating the book which is one of my points in writing you because ... another reader (this EMI readership is a great network of people it turns out!!!) directed me to a booksellers/bookpublishers outfit in Pennsylvania, *Honeyrock*, and on talking to Rick LeVan there he mentioned the possibility of them re-publishing and reissuing the McCallum book – and maybe if lots of people wrote and expressed an interest in this project, it might become a reality! Great book, a wealth of information! I don't believe I ever noticed Honeyrock mentioned in EMI, maybe it's my oversight but they're a good source of percussive musical scores (lots of pan stuff from "panyard") and lots of marimba stuff too. Their address is RD4, Box 87, Everett, PA 155537.

Peter Hurney

IN RESPONSE TO Peter Hurney's letter (March '93, Vol VIII #3), re: search for mirliton membrane. I've had luck using the following media on flutes, gourds (for mbira – yes!) and other instruments: "CONDENSER PAPER," stretched and lacquered. Order from any indoor model airplane business, such as –

Micro-X Products, P.O. Box 1063, Lorain, Ohio 44055
Fai Model Supply, P.O. Box 3957, Torrance, CA 90510; (213)830-8939
Peck Polymers, P.O. Box 2498, La Mesa CA 92041

[Procedure for preparing the condenser paper membrane:]
Mix wood glue 50/50 with water. Use finger to spread glue mixture on a cup's rim. Place condenser paper on top. Dry.

Spray rubbing alcohol on stretched paper. Dry, then spray with lacquer. Let dry *well*. Cut to size.

Good luck and thanks for EMI.

Andy Cox

I PURCHASED THIS STRANGE metal reed instrument [see photographs below and next page] recently and have not been able to find out the name of it, where it was used, and for what it was used. A lady who sold it to the music store said it was a "Flugel Horn"! The store manager kind of chuckled and said "Yeah?" He didn't know what it was really called either!

The instrument is an all metal, chrome color, professional musical instrument, not a toy! It is totally about 31/2 feet long and has eight conical tube bells (each like an elongated ice cream cone) varying from the shortest of 16" to the longest of 36". It plays only a range of one octave (eight notes). The tone is formed by a metal reed in the narrow end of each of the eight conical tube bells. The small ends of the tubes are clustered together around the large end of a second metal cone, about 4" long and about 2 1/2" in diameter

Right: Professor Schulzenheimer (Duane Schulz) demonstrates the mystery horn.

at the large end. A metal tube, about 3/4" in diameter and 2 1/2" long, comes out of the small end of the second metal cone which you blow into to get a tone. (This tube may have had a round metal cup attached to it at one time.) In this second metal cone are three valves like a trumpet [see photos] which guide the air to the conical tube you want to sound. The fingering for the scale is not like a trumpet!

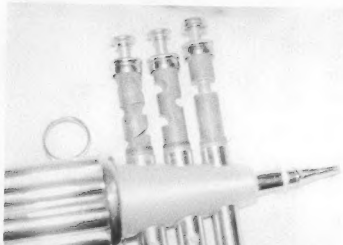
Low G = Open, A = 3rd Valve, B Flat = 2nd Valve, C = 3rd & 2nd Valves, D = 1st Valve, E = 1st & 3rd Valves, F = 1st & 2nd Valves, High G = 1st, 2nd & 3rd Valves

The instrument is like eight different pitched auto horns without the rubber bulbs. You just blow air in the mouthpiece tube end and use the valves for the different pitches.

The instrument has a metal strap about 1/2" wide wrapped around all the conical tubes in the middle which holds all the tubes together. The conical tube bells are made of some type of metal which is chrome plated and makes the instrument quite attractive. It weighs about eight pounds – rather heavy! It has two metal loops, one close to the small end of the longest conical tube and one near the bell, for a carry strap. Or the metal loops may be a place to hang a banner or flag or some type of insignia for decorative purposes while playing a fanfare. It also has a music lyre holder and ring for the little finger. Stamped on the second metal cone (where the valves are) are the words "Made In Germany". Each bell has the name of the pitch of the bell tube stamped on it and a number "24", which may have been the number of instruments made at that time.

One person thought it might have been used in a Kilter Band in Germany. Another said it may have been used for fanfares at military parades or concerts or military presentations in Germany. I think it must have been built by some professional musical instrument manufacturing company in Germany. I am asking if anyone might have any information available as to what this instrument is called, what it was used for, and where it was used, or where I might look to find any such information.

Duane Schulz
6916 X St.
Lincoln, NE 68505



Above: Close-up of the mouthpiece end of the horn, showing the valves.

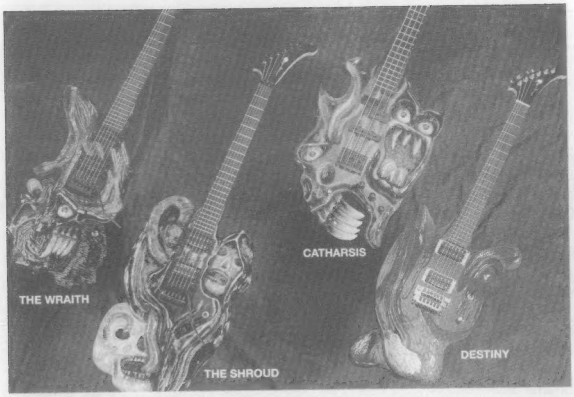
Left: The valves pulled out to show the inner pistons.

NOTES FROM HERE AND THERE

DEVILS FIDDLES were the topic of study in Hal Rammel's article appearing in EMI Volume VII #3 and #4 (Nov 91 & Jan 92). Included with the article, among photographs of Devils Fiddles from around the world and across the years, was a Devil's Fiddle that Hal himself had made in connection with the research. Since then he has made another. The photos here show the new improved version, with its notched

bow, its string and its many percussion features, played by son Karl. Hal will be presenting this instrument, along with his Devil's Fiddle paper, at the convention of the American Musical Instrument Society on May 16th in Nashville, Tennessee.

THE HAAGS GEMEENTEMUSEUM in the Netherlands houses one of the world's leading musical instrument collections. To help meet a demand for technical drawings of historical instruments held in the collection, the museum has now published a brochure listing drawings available. Included are drawings for several recorders, transverse flutes, oboes, a bassoon and a bagpipe, organs, harpsichords and clavichords, several bowed strings, guitars and citterns, plus one each for lute, cither, hurdy-gurdy and timpani. For more information write Haags Gemeentemuseum, Stadhouderslaan 41, PO Box 72, 2501 CB The Hague, The Netherlands.



IT IS POSSIBLE to make a functioning electric guitar with virtually any body shape, as long as certain requirements involving rigidity, mass and playability are met. EMI recently received promotional materials from Dreamweaver Ltd. (1015 Commercial Blvd. North, Arlington, TX 76017) for their line of hand-carved guitars, designed by Robert Beverly. The photo above shows four of them. Dreamweaver's literature says they can custom-carve your instrument to fit your chosen theme or fantasy (in case fangs and bulging eyes are not your cup of tea).

VOLKER HAMANN PLAYS THE BRUSSELHORN in the photograph below. He sent the picture along with news of an exhibit-plus-catalog called *Refugee* that took place in Bergisch-Gladbach, Germany in April. The exhibit functioned as a statement against violence against foreigners in Germany.

THE VESTAL PRESS CATALOG has long been the leading source for information on mechanical music machines from player pianos to orchestrions, as well as theater organs, reed organs, and a host of nonmusical topics -- carousels, picture postcard history, slot machines and more. The catalog included books and recordings published by Vestal Press, as well as materials from other publishers in the same subject areas. There were plenty of things to be found there that you would find nowhere else, such as technical drawings or reprints of owners manuals for a number of once-popular mechanical instruments. EMI reviewed some of the material in August 1988 (Vol. IV #2) and August 1990 (Volume VI #2)

Now the people at Vestal Press have announced they will no longer be putting out their wide-ranging mail order catalog; they will no longer serve as the one-stop shopping center for people interested in their specialty topics. They are dropping the re-selling side of the business in order to focus exclusively on publishing. BUT, to fill the gap, they have come out with *The Vestal Press Resource Catalog*. This new catalog is basically a listing of the contacts you need to buy direct from the producer all the things that were previously available in retail through Vestal Press. The plan is to publish an updated version of the Resource Catalog each year. The 1993 version is out now; its cost is $9.95, from Vestal Press, 320 N. Jenson Rd., PO Box 97, Vestal, NY 13851-0097.

One other note: Vestal Press' Grace Houghton writes, "In our files we have a number of printer's flats that were used to produce catalog reprints and other specialty publications. We would be happy to make these available at very reasonable costs to persons interested in putting these items back onto the market. Contact us [address above] for further information."

CORRECTIONS

Due to a word-processing error, a stray paragraph was accidentally tacked on to the end of the review of Neil B. Rolnick's **Electricity** in the reviews section of EMI's last issue, undermining an otherwise positive review. Apologies to Neil Rolnick and to reviewer Mike Hovancsek, who was not responsible for the error.

The schematic accompanying Bonnie McNairn's homemade theremin article in the last issue contains some potential bugs; see Phil Krieg's letter outlining them in this issue.

LETTERS POLICY

EMI is happy to print letters from readers on topics related to the magazine, including anything concerning musical instruments, matters relating to the magazine itself, and anything else the readers can be expected to find relevant or interesting. We don't print letters that are potentially libellous or in monumentally bad taste, but, so far, we haven't gotten letters meeting those descriptions. We don't print form letters sent for promotional purposes. We occasionally edit very long letters for reasons of space, and we routinely omit portions of letters dealing with matters that are not of interest to the general readership, such as requests for back issues or other office business. We try not print letters which the writer did not intend for publication. Sometimes it's hard to tell whether a particular letter was meant for publication, and we have to double check with the writer. You can help the editor in potentially ambiguous cases by indicating whether you wish to see your letter published, or by indicating which portions of your letter are for publication. EMI's Letters Column is a good forum for communication with the readership as a whole, and I encourage everyone to continue to take advantage of it.

STARDUST

by Reinhold Marxhausen

Childhood in Minnesota was
a delightful experience.
The open spaces
The parsonage with eight children
three cows, pigs, dogs,
  cats, large garden
and silence.

I amassed a large collection of
four, five, six and seven leaf clovers
while herding cows
along the country roads
after school.

Church hymns like
Rock of Ages
played by mother
or ridged sounds of scales
  being practiced
could often be heard coming from
the parsonage.

Saturday was my piano lesson day
which meant walking for two miles
up the country road
carrying a pail of fresh milk
in exchange for the lessons.

The sounds of scales sounded stiff
compared to the hum I heard
by putting my ear to the telephone pole
on my walk home.
I had visions of hearing people
talking to each other from
Minneapolis to China.

People wheeling and dealing
families visiting
someone breaking the bad news
social gossip
new ideas shared
problems being solved.

There was excitement
in that ditch.

Playing the scales on the piano was
boring and hearing someone play
on whisky bottles on the radio
  one evening
was stimulating.

Empty bottles could easily be found
in the country ditches
while herding cows.

Tuning bottles was easy.
Tap the surface with a stick
add or subtract water until
the desired note is achieved.

An entire octave can be obtained
in a single bottle.
Flat bottles are better than
round
and flat rounded hip bottles
had the best tone of all.

From the low, water-filled
  quart whisky bottles
up to the small medicine bottles
four octaves were easily attained.

I became a teen age performer
for banquets and conventions
playing
Bells of St. Mary and
Beer Barrel Polka.

Then I learned to play
  the carpenter saw.

I auditioned for and was asked to
play the 32 measures for saw solo
in the Khatchaturian piano concerto
in the Lincoln, Nebraska, symphony.

A violinist played my part
  which was recorded
on tape
so I could now memorize it
by listening and playing.

The elderly woman
in the violin section
almost cried as she said to me,
"It's only a saw".
I did not reply
"You only have a violin"

Khatchaturian wanted a saw sound.

Music instructors and
band directors tend to have
  strong feelings about
  which instruments are
more acceptable than others.

As a freshman in Lewiston High
I bought a C Melody Sax
from the band director.

I played it in his band.

The next year I transferred to
Austin High.
The first day in band I asked the
director where I should sit
with my C Melody Sax.

"Your what?" he raged
in utter belief.

When we were all seated
he managed to embarrass me in front
of the entire group by saying,
"Some idiot sold this young man a
C Melody Sax and he should be
hung at sunrise."

He went on and on.
I felt bad.

I felt worse in the months that followed.
I was allowed to sit
  with the regular sax people
but there was little
  C Melody Sax sheet music
so I had to use
Oboe, bassoon, E Flat Alto
or whatever music was left over.

I learned to transpose music
but mostly
I learned to play by ear.

The gravel on the
country road was more than
crushed rock.
It was gravel from the river beds
that rolled and tumbled for eons of time
so that rough corners
and edges were now smooth.
There was always the search
for the better stone
for my pocket.

Stones are pocket art.
Stones are more sensual in pockets
than pennies.
and other loose change.
Stones in pockets are worry stones
and rosaries.

Once I found a stone that was brown
irregular and very smooth.
It was heavier and looked a bit melted.
I remember showing it to a wise, old,
bearded, rock hound pastor
from Morristown, Minnesota.
Rev. Zimmerman's house and life was
filled to overflowing
with interesting stuff he had collected
in his lifetime.
When he saw my brown stone
his bushy eyebrows twitched
his mouth opened with a slight gasp
He looked at me and said,
"Son, this is a meteorite
a star."

That stone became special to me and I
carried it around
to surprise my friends.
I was the boy with stardust in his
pockets.

Giving candy on Halloween eve
is boring
and unnecessary.

In the 1960s
I picked up 35 rocks
from the gravel in the driveway
cleaned them up and placed
them in plastic bags with a note:
"This is for your pocket"

Halloween eve was spent
dropping the little bags into
large brown bags.

At school the next day
the rocks were lined up in a neat row
on top of the piano and children compared
and discussed them.

My two small sons announced that
the children at school who did not get
rocks
wanted some.

Artists are people who pick up stones
for people who can not
or do not know how.

When the pet rock fad came into being
I was happy and excited.

Now people would become aware of
stones
beauty of form
of portability
and the inherent therapeutic effect.

I had a fantasy that stone would be loved
that they would be given as gifts
and people would become more aware
of nature.
That did not happen.

A right brained idea quickly became
a left brained one

The pet rock was painted and changed
put into cages
dressed up to look like people
or animals.
They were left at home on the end tables
and became the focus of
ethnic jokes at
cocktail parties.
"Did you hear the latest pet rock joke?
Ha Ha Ha Ha Ha Ha Ha Ha"
Words and laughter that ridiculed the
form of an object
and turned the poem
into prose.

The pet rock promised
a new view
but instead of imagination
and feeling
it was overshadowed by logic
and meaning.
When the laughter died down
the pet rock died.

Poor rock.

Now there is a new pet rock
which cannot be translated into prose.
It will always be magic
and a poem.

It is called Stardust.
A black rock that fits into
the palm of a hand
has bumps for finger tips to explore
gives vibrations that tingle
when shook.
It is a friend in need
to give energy or song.
In anger it can be tossed
thrown or beaten without breaking.
Blends perfectly with nature
and when lost
will never be found.

So ordinary
and dumb looking
until one hears a tiny wonderful
sound and the obvious question
"What's inside?"

Knowing the physics of a rainbow
a violin, or vocal cords does not
help us appreciate that which appeals
to our senses.

Stardust is an experience
and cannot be explained easily.

James Irwin walked on the moon.
Before he died he told me he carried
two objects in his pocket every day.
An actual rock from the surface of
the moon
and one of my
Stardust.

Which one is real?

It was a boring Saturday
at the Mills College
sculpture studio
in California.
No plans for the day.
I found a door knob on the table
and welded some wires on one end
just for the fun of it.

I placed the knob to by ear
and strummed the wire
on the opposite end

WOW

I got another door knob
welded some wires on it also
and connected the two door knobs
with a metal wire which went over
my head so the knobs
were against my ear.

I invented a manual Walkman.

Students on campus loved to wear
and listen to it. I sent it to Art
Linkletter who was marketing toys in L.A.
and he was delighted
and decided that every child in America
ought to have one.

A two year contract was signed while he
and the Japanese tried to perfect this toy.
After two years
he released all rights back
to me because it was impossible
to produce
a toy that was safe for children.

I continue to make head pieces
which continues to delight me
and my friends.

When you can listen to a door knob
you are free.

I discovered
that when you place
one end of a long chunk
4"x 4"x 8 feet long
of styrofoam
to your ear and have someone whisper
at the other end
you can hear the words clearly.
(Did it on the Letterman show in 1991)

I was curious.
Would the sound travel
thru the same material
for a city block?

I attached 16 chunks end to end
taped a small radio on one end
at medium volume
walked to the end of the block
placed the end to my ear
and I could plainly hear the news
from the radio.

It is all very hard to believe.

I have not met anyone
who knew this.

My next move is to try a mile or at least
6 city blocks

Maybe the sound gets louder.

I have created many instruments
using styrofoam
The sounds surprise those who assume
that the soft material would
suck up or muffle the sound.

Not true.

I have made a bass fiddle
a cello, mandolins
and other forms out of
this amazing material
just when we are trying to rid it
from our environment.

The Japanese have an instrument made of
very expensive and beautiful wood.
The koto is tuned by moving the bridge
under each string
and then strings are plucked like a guitar.
By using a chunk of styrofoam
and inverting styrofoam drinking cups
with the bottoms cut out
as bridges
I produced a similar sound.

Xylophones, pianos, keyboards
produce sounds from rods
bars or strings of various lengths,
when struck with mallets
of various kinds.

Hollow aluminum tubing of various
diameters
when cut to various lengths
and tuned
becomes a xylophone.
The rods will also produce a sound
when they are dropped or tossed
or flung
from a two story window
to the cement steps below.

My hollow rods are color-coded
with a piece of colored paper
taped to one end (red – C yellow – D)
There has to be a rod for each note
when you play a tune.

On a sheet of paper all the color dots
are arranged in sequence
so if dropped
the desired tune will be heard.

Throwing tuned aluminum rods
in a parking lot at night
to produce dancing music has to be
environmentally sound
at its best.

An alley in Washington D.C.
consisted of two brick walls
only 4 feet apart and I flung
Amazing Grace
with the rods on the walls
in that space
with a bounce
ricochet
and reverberations
I will
never forget.

The rain water runs down the shingle roof
of my studio
drops over the edge
and lands on the wooden floor.

I collect empty tin cans of all sizes
which are stored in a box
until it rains.
Then each is placed
bottom up under each rain drop.

WOW

What wonderful sound and
random
rhythms.

Some drops come down fast
some slowly.

Last winter the roof was covered
with snow.
The sun was warm and at noon
the first drops came down
on the cans.

By mid-afternoon and early evening
the neighborhood
was vibrating with
machine gun
staccato symphonies
never heard before.

As evening cooled
the pace slowed
and became more
gentle.

From my bedroom
I could hear the
day slowly come
to an end
and close
with a single
and last
dink

PICKETY WICKETY
CLICKETY CLACK

A picket fence
does not have to look even.

It can be uneven just as well.

When it is uneven,
the sound will be more interesting
when the neighborhood boy
comes by with his stick
to drag along
the staves.

Long staves make low notes

short ones high sounds.

Why not cut sticks and tune them
when building a fence?

Arrange them so a recognizable tune
can be played.

Let the child in the neighborhood
discover that the fence has a tune.

Change the tune
each year.

Breaking the sound barrier is as important
as breaking the sight barrier.
The sounds we accept are as stereotyped
as the sight we call beautiful,
pretty.

Maybe the word delightful
can better describe
the response that is needed
in order to have a significant
relationship to sight
and sound.

Delight should be our response to art
as it pops up unexpectedly
here and there
in our environment,
as we create it or as it is
found
in nature.

One seldom understands art
or art forms
and responding comes only
when we are fully awake
and
alive.

Delight is satisfying,
immediate
better than cute.

Delight is filled
with joy
spontaneous
accidental.
Delight is irrational, irreverent
Delight is to expect the unexpected.
Delight is a giggle unexplained.

Delight never happens
when we know too much.

William Blake said
He who binds himself a joy
Does its winged life destroy
He who kisses a joy as it flies
Lives in eternity's sunrise.

The little boy's two hands were
closed tightly.
They held something valuable.
He said he had some butterflies.
What good are butterflies when they are
in a fist?
They need fresh air and sunshine.
Grudgingly the two fists
slowly opened.

Unbelievable.

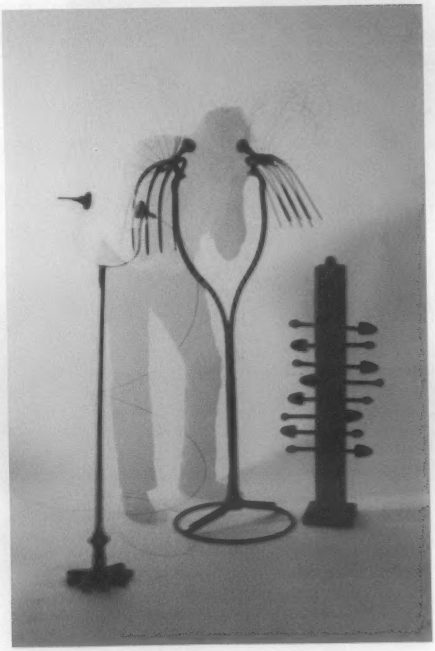
Seven beat up butterflies flopped about
the fresh air
like sheets of
plywood
in a
hurricane.

How does a small boy
capture
and contain seven butterflies
in his
fists?

The same way adults
fill their lives
with things
that will look good
on the mantle
over the
fireplace.

Below and on the following pages:

SOUND SCULPTURES BY REINHOLD MARXHAUSEN



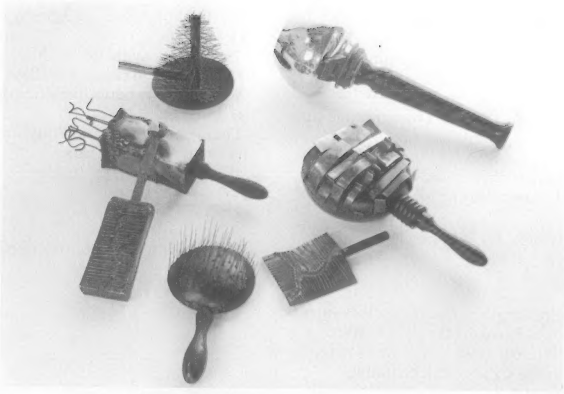
Left: THREE UPRIGHT FORMS.

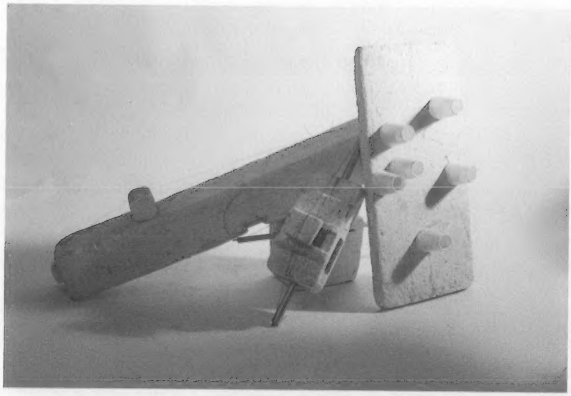
Left object:
Two door knobs as sound chambers with dangling piano wire coming out from each. The end of the dangling wire hardly touches the floor. When you place your head between the knobs a spring allows one to tilt the head either way so that when the end of the wire touches the floor, the resulting sound is amplified in the knobs. The base is a metal burner from an old kerosene stove.

Center object:
The base is a steering wheel from a car, the upright stem is an old lawn mower handle and the top has two pitchforks with door knobs which can be grabbed when you place your head in between and wiggle it from side to side so that the curved piano wires on top produce a sound that is amplified by the door knobs.

Right object:
A wooden organ pipe has 8 women's shoe trees attached to it. When the shoe trees are manipulated they produce a **yuga** kind of sound.

Right: HAND-HELD FORMS made from a variety of closed and open metal objects which are encrusted with metal flanges and piano wires of various lengths. The coffee perc can be thumped with the fingers. Some of these forms may even be dangerous and need to be handled gently.





Left: STYROFOAM OBJECTS
WITH MONOFILAMENT STRINGS.

Right object: Solid styrofoam with one string which sounds like and can be played like a bass fiddle.

Center object: A styrofoam packing case with an aluminum rod through the center that can be turned so that the attached string can produce high or low notes.

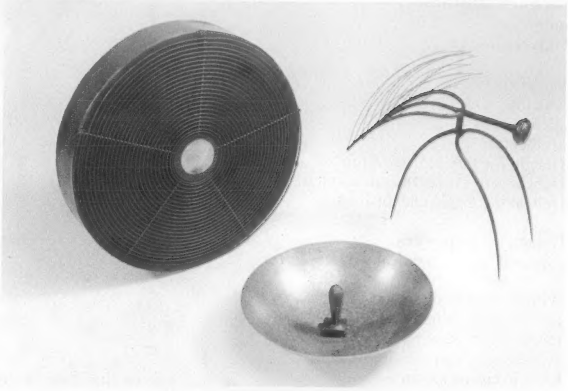
Left object: Chunk of styrofoam with inverted cups with their ends cut out which act as bridges which can be tuned by merely moving them left or right until desired note is achieved.

Right: THREE SOUND OBJECTS.

Left object: An air conditioner grill was mounted on a circular box so it can be played by strumming the long or short metal rods.

Center object: A Chinese cooking wok has a handle mounted in the center. When struck it produces a long sustained tone when the ear is placed 2" from the edge. The strongest vibration is **only** at that spot and goes on for a very long time.

Right object: Two pitch forks, door knob and wires.



Left: THUMPING AND LISTENING TO TWO UPRIGHT GONGS which produce a sustained sound when struck and listened to 3" from the edge. The object on the left is from a washing machine, and right is a disk from a farm machine.

Right: MORE HAND HELD SOUND PRODUCING URCHINS which are dangerous and incredibly beautiful when they are treated gently and with respect and a sense of adventure, curiosity and discovery.

Below: MANUAL WALKMEN.

Following page, above: BY USING MORE METAL, the Manual Walkman helmet produces a much richer environment.

Following page, below: THE SMALL ORBS are called **Stardust**. They are private, great for the pocket and produce a gentle and beautiful sound when shaken.

THE LARGER ORBS come as a pair and are my attempt to produce an object to replace the need for drugs. They also produce a gentle sound when shaken, but the most surprising sound comes about when the two are struck together, sharply, and then placed snugly to the ears so they touch the skin. The vibrations produces a mind massage which is vigorous and gentle at the same time.

THE BOXLIKE FORMS are called **Cosmic Cubes** and are played by gently rotating and listening. The cubes, Stardust and parachimes are philosopher stones and objects. They are ugly, beat up, discolored, bent, unobtrusive, and objects to be avoided if one were to accidently stumble upon one in an alley somewhere. They are not attractive on purpose. No one knows what beauty is. Beauty is hidden.

(See the photo captions for these pictures on the previous page.)

HAL RAMMEL'S SOUND PALETTE

by Mike Hovancsek

Hal Rammel is a regular contributor to EMI. His bowed instruments have been featured in this publication, on his own cassette releases, and in several concert appearances. His most recent instrument, the Sound Palette, is a series of wooden rods mounted on a wooden artist's palette.

Hal designed this instrument as an extension to his experiments with bowed saws, triolin, aerolin, and Richard Waters' Waterphone. His interest in "tabletop" instruments (e.g. Tom Nunn's electro-acoustic percussion boards and Hugh Davies' Sho-zyg) as well as his curiosity about an instrument played by Victoria Chaplin in **Le Cirque Imaginaire** (a serving tray holding an array of glasses played with a bow) led to the development of this unique instrument.

Amplified by a contact microphone mounted on the body of the Palette, the instrument brings life to every sound source that touches it. Hal plays his sound Palette by plucking and bowing the wooden rods, placing music boxes, wine glasses, and other objects on the Palette, and making vocal sounds near the contact microphone. The timbres emanating from this instrument include microtonal Kalimba-like plucks, soaring bowed pitches, and subtle friction coos.

Hal further modulates these sounds with a digital processing unit and a delay unit in order to create a flurry of activity that provides accompaniment to the real-time performance. He often uses reverb to create counterintuitive spatial environments, for instance, rapidly changing from a closet-like reverberation to a stadium-like echo.

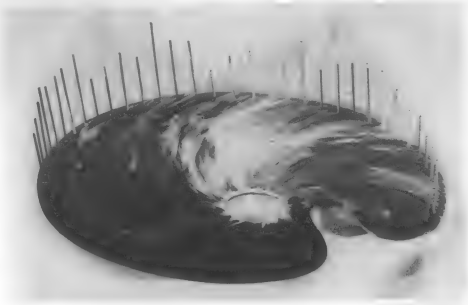
Quoting Hal, "Sound Palette improvisation hungers for this world in motion, an *animate* landscape of accelerated growth, sudden decay, unexpected dissolves, arrivals and departures, with a vivid sense that the visible and the invisible have exchanged places."

Above: Hal Rammel at Gallery 218, Milwaukee, 1992 (playing Sound Palette).

Photo by Gina Sutherland

Graphics on this page by Hal Rammel

The Sound Palette is a simple instrument that enables the performer to synthesize a huge assortment of acoustic timbres into a dense fabric of organic sounds. Contact Hal at P.O. Box 1836 Evanston, IL. 60204-1836 to hear recorded examples of his instruments.



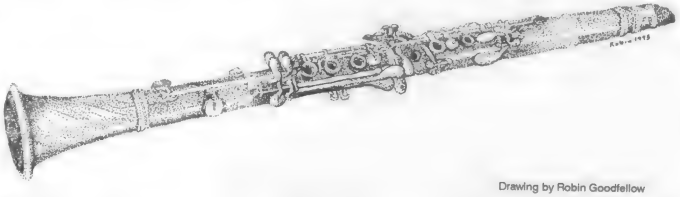
Right: The electro-acoustic Sound Palette, designed & built by Hal Rammel

COMPUTER ANALYSIS OF CLARINET MULTIPHONICS

by Kenneth J. Peacock

Readers of **Experimental Musical Instruments** have undoubtedly heard young clarinetists, who struggle desperately to avoid the dreaded squawk which their instrument is all too likely to produce. Many might be surprised, however, to know that refined versions of that sound are being practiced by professionals for the elegant expression of new ideas. What are these sounds? And why do they sound so different? During the last twenty-five years or so, selective use of "multiphonics" and multiple sonorities (sometimes called "double stops") has been widely accepted by composers, performers, and even by audiences as a legitimate and musically useful technique. Many believe, in fact, that these new clarinet sonorities will eventually be considered no more unusual than traditional multiple stops in string writing.

The term "multiphonics" is usually reserved for those loud, more raucous and intentionally "non-clarinet" sounds."Multiple sonorities," on the other hand, implies clarinet chords in which the various pitches are easy to distinguish since the particular combination forms a simple harmonic relationship. The focus of the present article is on the more complicated "multiphonic" sounds.



Drawing by Robin Goodfellow

Like many innovations throughout history, contemporary multiphonic techniques have developed through independent experiments which often occurred simultaneously. Bruno Bartolozzi worked extensively with these sounds, and his *New Sounds for Woodwind* is perhaps the most familiar source of information on multiphonic techniques – especially for musicians outside the clarinet world. This book was published in English in 1967, and a revised edition appeared in 1982 after the author's death. Another important source concerning these extended techniques is Philip Rehfeldt's *New Directions for Clarinet* (1977). William O. Smith was one of the earliest composer/performers to experiment with multiphonics, and his first recorded example was heard in *Five Pieces* of 1959. Others such as Hans Rudolf Stalder in Switzerland and Alan Hacker in England had also been developing these new multiphonic techniques. These sounds have gained greater currency today, probably due in part to the influence of electronic music which has "stretched" our ears. As non-traditional sonorities became common, it was a short step to the acceptance of similar sounds from traditional instruments.

One of the attractions for composers using clarinet multiphonics in their works today is that these rich sonorities provide timbral variety comparable to electronically generated sounds, but with an additional quality which is only possible with a human performer. In fact, a complaint musicians have often voiced about purely electronic music concerns the "fixed" quality of the sounds. There is an acoustic difference, for example, when a digital piano sounds a chord, and when several notes are sounded with a traditional piano which has vibrating strings. The difference can also be heard in recordings of both types of instruments. This is in part because a digital piano keyboard triggers "sampled" (digitally pre-recorded) individual notes from a traditional piano which do not physically cross-influence each other in the same manner as vibrating strings.

Even with the most powerful digital systems available, it is still not possible to duplicate the constantly changing timbral effects which occur during a "steady-sounding" multiphonic, yet these minute changes are precisely what accounts for the lifelike sound. Digital synthesis techniques employing what is termed "frequency modulation" have much improved the musical quality of machine-generated sounds, however, by making possible subtle dynamic timbral changes which approach the quality of live instrumental sound. For this reason, we can expect composers to show greater interest than they have in the past in combining solo clarinet multiphonic writing in new interactive works for synthesizer and traditional instruments.

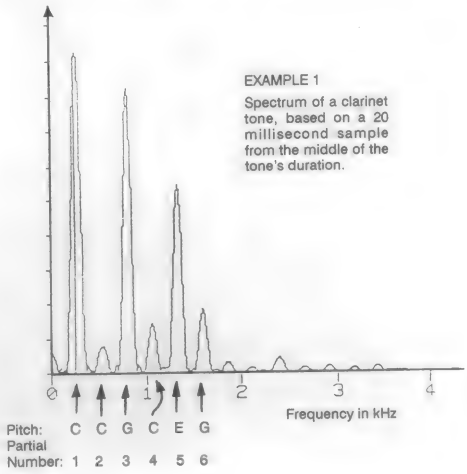
What actually occurs during a multiphonic, or any other tone for that matter? A graphic illustration is perhaps the best way to answer this question. To achieve this, analog "sound spectrograms" or "voiceprints" have been used as early as 1947 to study the varying component characteristics of frequency, time, and amplitude in complex sounds. More recently, digital techniques have been employed by researchers at Bell Laboratories and elsewhere, since this method allows for more sophisticated analysis as well as greater accuracy. The present study of clarinet sounds began by digitally recording short "samples" performed by F. Gerard Errante, who frequently uses multiphonics in the music which he composes and performs. The data was then processed using a Synclavier sound Synthesis/Analysis system to generate computer graphics via the mathematical technique known as the Fast Fourier Transform. (For an excellent introduction to spectrum analysis, and discussion of FFT technique see David Courtney's article in the September 1992 issue of EMI.) From among the approximately fifty (!) direct-to-computer recording systems available today, other systems could have been used, including the popular Digidesign software system for the Apple MacIntosh which many musicians are familiar with. The resolution of the graphics produced by different computers would vary depending on the relative "horsepower" of the particular system, but the basic approach discussed here would be the same.

While the attack and decay of a sound are extremely important in the way we hear timbre, our ears are also extremely sensitive to minute changes in the "spectrum" of the sound — those frequency multiples of the particular sounding fundamental. Like using a prism which separates white light into the colors of the rainbow, spectral analysis allows us to see individual components of a complex sound. For example, a low-frequency note, which is played loudly and which we hear as a single pitch, actually contains dozens of frequencies which are multiples of the lowest tone. These generally follow a harmonic series — two times the lowest frequency, three times the frequency, four times ... and so on. The terms "overtone" or "harmonic" refer to those frequencies related harmonically to the fundamental and to each other, while "partials" indicates *any* component parts of a sound. Studies of clarinet tones have shown a general tendency for the sound to be characterized by stronger odd harmonics with most of the sound energy confined to the lowest few frequencies. But this acoustic information alone, however, was of little use to composers who attempted to synthesize the true sound of a clarinet electronically. I remember my own disappointment when first trying in the studio for an electronic clarinet sound after being told "the clarinet sounds like a square wave producing odd harmonics rather than even." What I didn't know then was that it is the *irregularity* of all parameters of the sound which makes synthetic duplication so difficult. The continuous timbral changes which occur even in a single "live" clarinet note becomes apparent in successive spectral images of the sound.

Spectrographic displays based on the Fast Fourier Transform technique illustrate the average harmonic content of a sound over a specified time period. The longer the time "window", the more accurate this mathematical average will be. Unfortunately, this single spectrograph is a "snapshot" which conveys nothing about how the sound changed during that time frame. If one were to specify extremely short time frames (perhaps a thousandth of a second, for example) in an attempt to capture the continuous musical change, not enough data would be provided for an accurate representation of the sound. The solution to this problem is a compromise. And by looking at a sequence of fairly small time intervals of twenty to forty milliseconds (a millisecond is one thousandth of a second), we can get a good indication of the changing sound. When these "snapshots" taken fifty milliseconds apart are superimposed and slightly offset on the same graph, a three-dimensional picture emerges which can be interpreted much like a topographic map which shows changes in the sound spectrum over a period of time.

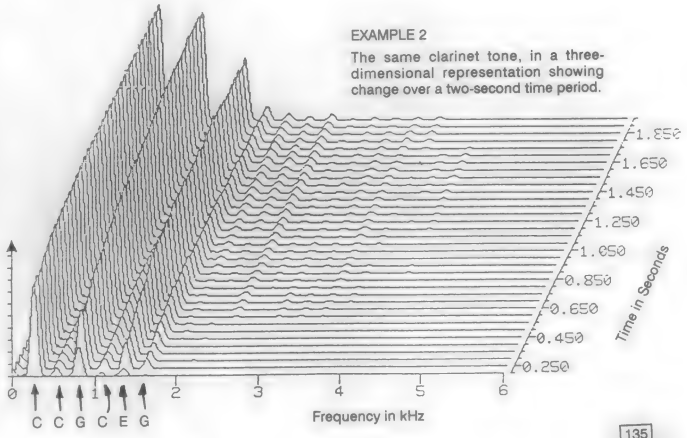
The first example shows the spectrum of a time-frame 20 milliseconds long in the middle of a clarinet tone sounding middle-C concert. The "spikes" are the various harmonics with the tallest one being the fundamental frequency. As expected, the odd-numbered harmonics (1, 3, 5) are emphasized by their greater amplitude. But notice that even-numbered harmonics (2, 4, 6) *are* present and that their "envelope" is different from the pattern of the odd overtones. As they get further away from the fundamental, the odd partials have less amplitude. The even partials demonstrate an increase in amplitude as they get higher in frequency. Remember that this is how the spectrum appears for only this brief time interval of 20 milliseconds, and that at other times, the "snapshot" of the tone would show a slightly different spectrum. In a way, this entire analytical process might be compared to looking at a sound with an "aural electron microscope" which is pointed at different parts of the sound at various times.

Example 2 shows two seconds of the same Middle C. If it were sounding, we would recognize not only the fundamental pitch, but also that it is a clarinet note since a characteristic overtone pattern is evident. Our ears (and brains) understand the pattern very quickly after the sound begins, and we are especially attuned to subtle changes which occur during the tone. In order to see (rather than hear) how the overtone



EXAMPLE 1

Spectrum of a clarinet tone, based on a 20 millisecond sample from the middle of the tone's duration.



EXAMPLE 2

The same clarinet tone, in a three-dimensional representation showing change over a two-second time period.

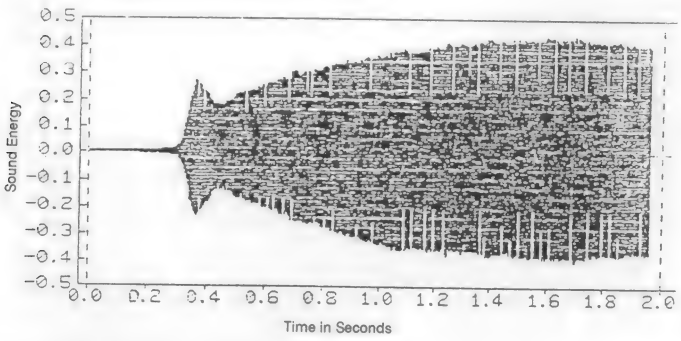
pattern changes during the note, a large number of individual 20-millisecond spectral displays are calculated every 50 milliseconds as the tone progresses. Thus the computer is used to generate a series of "stop-action pictures" so that detailed visual examination of what we hear intuitively is possible. When these are overlaid and slightly offset, the result is a three-dimensional "contour map" of this particular sound in which the frequency scale is on the bottom from left to right, the amplitude of each harmonic is shown vertically, and time scale (on the right of the graph) is read at an angle in a direction from the bottom center to the top right of the example.

Notice that each of the partials follows a slightly different "envelope" as the sound unfolds. The fundamental C quickly reaches a high amplitude level and this is generally sustained throughout the sound. The next loudest partial (the G an octave and fifth above the fundamental) reaches its steady-state by dropping back slightly from the sound amplitude it reached after 25 milliseconds. Then it increases in magnitude gradually up to about one second into the sound. Each of the other overtones have individual patterns of changing amplitude.

Although it is difficult to see in the above display, minute changes in the pitch relationships between each of the partials in any sound also contribute to the "live" quality. This phenomenon, where some of the partials increase their pitch while others simultaneously decrease in pitch, is more obvious in the spectrographs of complex multiphonics. The usual harmonic patterns in these multiphonics tend to destabilize the normal overtone pattern.

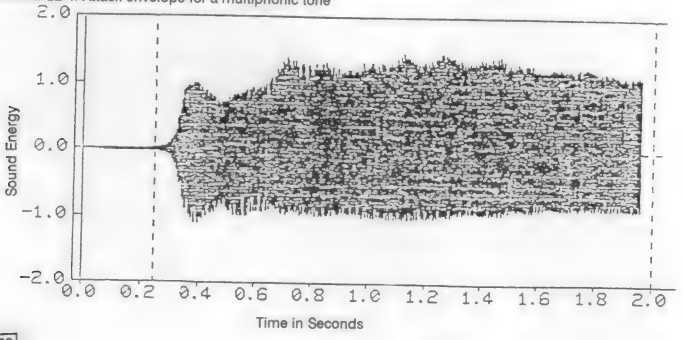
Traditional acoustic explanations are not entirely satisfactory in describing what happens when a clarinet multiphonic is produced, but a few general statements can be made. Woodwind performers are aware that when the speaker keys are opened, the vibrating air column tends to behave in a manner which facilitates production of higher harmonics. By also opening the upper finger holes, higher frequencies can be played since the air column will vibrate in shorter sections. Thus a normal fingering is modified by opening one or more of the holes which would usually be closed. This disrupts the air column. The effect is to reinforce certain partials while eliminating others since the vibrating air column is forced to divide evenly into short segments of the longest standing wave produced in the tube. If the suppressed partials are the ones which normally accompany a particular fundamental (i.e., the harmonics of the note), that fundamental will no longer sound the same. In fact, if the emphasized partials which are produced as a result of the multiphonic fingering are not related harmonically to each other or to the fundamental, the sound may resemble a gong more than a clarinet. Control of these new timbres is another matter since the sounds are certainly influenced by reed vibration patterns which are not clearly understood.

EXAMPLE 3: Attack envelope for a conventional clarinet tone

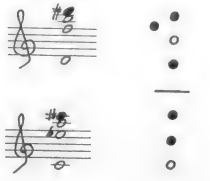


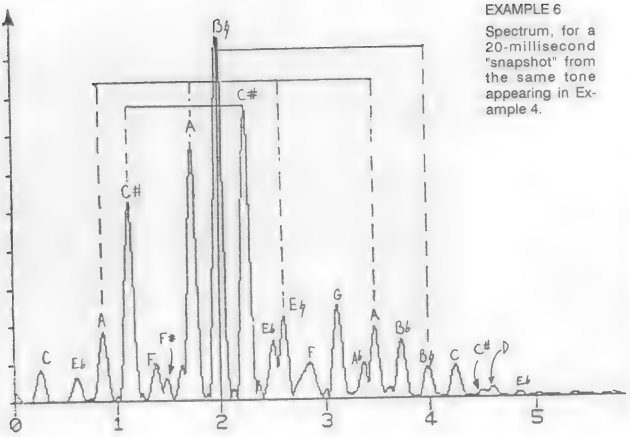
For comparison, Example 3 shows a computer representation of another two-second clarinet tone. The tone begins smoothly, and after a typical decrease in volume shortly following the initial attack, it gradually increases in sound energy. When this graphic is compared to a similar display of a multiphonic as in Example 4, it becomes apparent that although the multiphonic *sounds* completely steady, there are fairly large fluctuations in its energy level. This is caused by the influence of many "unrelated" partials in the complex sound which tend periodically to reinforce or cancel each other

EXAMPLE 4: Attack envelope for a multiphonic tone



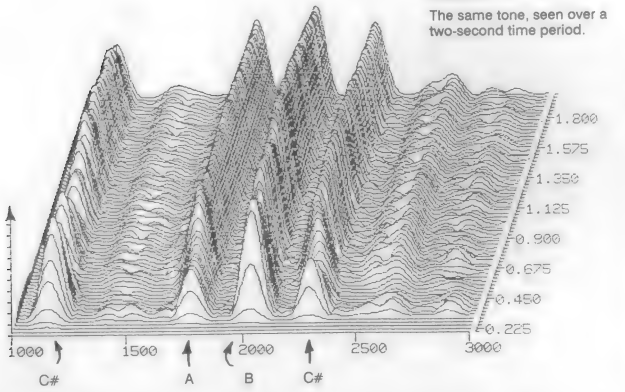
EXAMPLE 5: Multiphonic from Example 4, in music notation at concert pitch (top) and transposed for Bb clarinet (bottom), with the fingering shown at right.





EXAMPLE 6

Spectrum, for a 20-millisecond "snapshot" from the same tone appearing in Example 4.



EXAMPLE 7

The same tone, seen over a two-second time period.

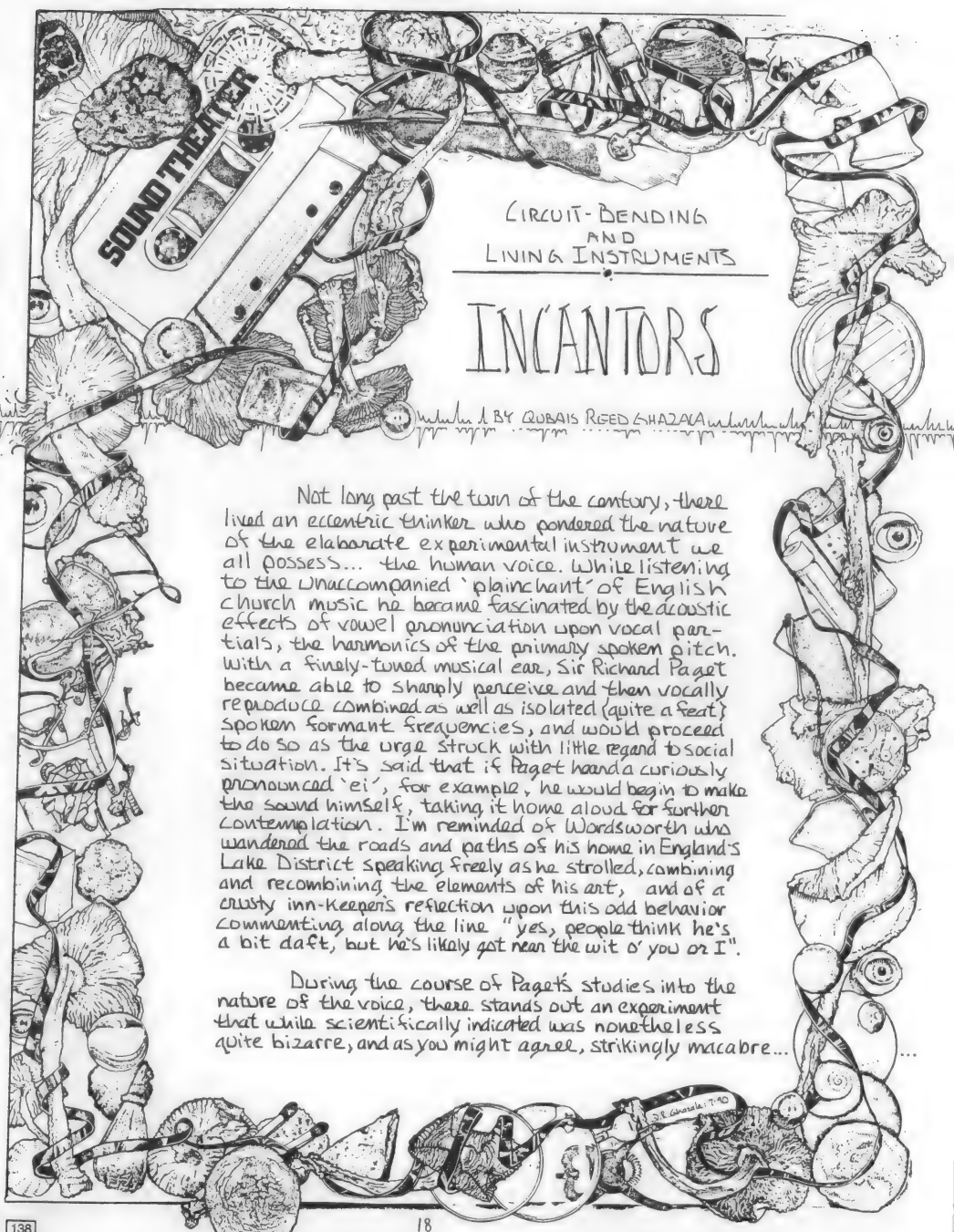
out. This multiphonic appears in slightly different versions in the books by Bruno Bartolozzi (1982, p. 49) and Philip Rehfeldt (1977, p. 51). For convenience, musical notation is given in Example Five at concert pitch, and for B-flat clarinet with the appropriate fingering. Black notes indicate approximately pitch names, and those of you trying this at home should be aware that the sound cannot be notated precisely. This accounts for the notational differences in the two sources cited.

Example Six is a 20-millisecond "snapshot" from the complete sound illustrated as Example 4 above. It is taken one second after the beginning. One can see that the notated partials C, E-flat, A and C-sharp are present as part of the sound complex, but they are considerably weaker than others. The "spikes" in the example have been identified with their appropriate concert pitch, and beams connect harmonically related partials. Since the three loudest partials in this sound (occurring around 2000 Hz) are only a step apart, the resulting "cluster" no longer sounds like it was produced by a clarinet. The prominence of the B-natural in this example is probably also influenced somewhat by a formant or natural resonance of the sounding tube (the clarinet) at this frequency.

An appreciation for the extreme complexity of multiphonics in general emerges as one considers the changes which occur during two seconds of this sound. Our final example illustrates what happens to the emphasized pitch region in this multiphonic. The frequency scale here is from 1000 Hz to 3000 Hz, and the spectrograph shows the strongest partials (C-sharp, A, B, and C-sharp) as prominent ridges on the contour map. In the illustration, activity of individual partials in this sound is clearly visible. Changes in the "altitude" of each ridge occur at different times, while pitch fluctuations are indicated by curves in the "ridge lines" which are parallel to the time scale on the right of the spectrograph. A curve in the ridge to the right illustrates a slight increase in pitch while movement to the left shows that the pitch of the partial dropped at that point.

While certainly not explaining all aspects of multiphonic behavior, the use of computer-generated spectrographs does allow us some insight into why these sounds are so varied and also why they are so different from traditional clarinet sonorities. Their complexity is due to the presence of many unrelated partials which interact in unpredictable ways. Since the exact role of such variables as air and lip pressure in the performance of multiphonics is difficult to determine, clarinetists will need to experiment individually. Mastery of these new timbres is undoubtedly a crucial part of contemporary performance technique, and an understanding of the acoustical behavior of multiphonics will aid and abet these experiments for those readers of EMI who now include the clarinet as an experimental instrument. We can also be sure that composers will continue to explore the exciting musical possibilities which these new sounds promise.

Kenneth Peacock studied music at the University of California and the University of Michigan where he received a Ph.D. He has performed as a conductor, solo French horn recitalist, and as a member of orchestras and chamber music ensembles. His research interests include acoustics, music theory, and electronic music. Dr. Peacock is Professor of Music at New York University, where he Directs the program in Computer Music Technology.



CIRCUIT-BENDING AND LIVING INSTRUMENTS

INCANTORS

BY QUBAIS REED GHAZALA

Not long past the turn of the century, there lived an eccentric thinker who pondered the nature of the elaborate experimental instrument we all possess... the human voice. While listening to the unaccompanied 'plainchant' of English church music he became fascinated by the acoustic effects of vowel pronunciation upon vocal partials, the harmonics of the primary spoken pitch. With a finely-tuned musical ear, Sir Richard Paget became able to sharply perceive and then vocally reproduce combined as well as isolated (quite a feat) spoken formant frequencies, and would proceed to do so as the urge struck with little regard to social situation. It's said that if Paget heard a curiously pronounced 'ei', for example, he would begin to make the sound himself, taking it home aloud for further contemplation. I'm reminded of Wordsworth who wandered the roads and paths of his home in England's Lake District speaking freely as he strolled, combining and recombining the elements of his art, and of a crusty inn-keeper's reflection upon this odd behavior commenting along the line "yes, people think he's a bit daft, but he's likely got near the wit o' you or I".

During the course of Paget's studies into the nature of the voice, there stands out an experiment that while scientifically indicated was nonetheless quite bizarre, and as you might agree, strikingly macabre...

Circuit-Bending and Living Instruments,
by Q.R. Ghazala

INCANTORS

(continued from previous page)

Sir Richard managed to procure a nearly complete human vocal tract, consisting of larynx, tongue, and surrounding tissue, from a cadaver destined to speak again. By means of compressed air, the vocal cords were set to motion while Paget manipulated the tract creating sounds that, while being greatly illustrative, must have been rather unsettling to witness. Plasticine models of the tract were made, and complex resonant chambers were added resulting in a series of acoustic speaking machines with one design appearing on the public roadways in the form of an astonishing motor-carriage horn that shouted "away! away!", hauntingly idyllic borne of research with a corpse.

Sir Richard Paget continued his explorations, receiving a patent on his method of artificially producing speech, and eventually directed a seven person ensemble in order that his machines might, in combination, produce a complete synthetic sentence. Each assistant played a resonator, and in unison they were able to create the sounds of a breathy human voice saying "Oh mother, are you sure you love me?" It was a romantic era, and sentimental notions were often emphasized. (But then again, maybe mom didn't approve of those nasty larynx experiments.)

Paget's illuminating theories, based solely upon his acute sense of hearing, have been closely upheld by modern research. But in addition to Paget, many others also helped pave the way to the 1930's dawn of electronic speech synthesis which circuit-bending* today further examines, pushing into a new context as I will shortly explain.

Investigations into speech synthesis prior to Paget extend far back into the past, and as in the last writing we once again find priests and deception notably intertwined. At the beginning of the Christian era, when by decree all things "pagan" or non-Christian were systematically destroyed by the new church in its rampage of theologic cleansing, shattered remains of sculpted Greek deities revealed secret speaking-tubes through which the voice of hidden persons could pass. The most famous of these was the oracle at Lesbos known as the speaking head of Orpheus. Upon its destruction such a tube was found running through the entire construction, beginning far back, hidden in the base, narrowing and eventually terminating at the statue's lips. But these deceptions did not end with the advent of Christianity.

Indeed, much speculation has revolved around the "brazen heads" said to have been in the possession of both Pope Sylvester II and Roger Bacon, while other conversing "enchanted heads" appear in literature of myth and history throughout the ages. In classic style of mechanical concealment such a head is described in Cervantes' book, Don Quixote. In this case, a hollow bronze bust of a Roman emperor sat innocently enough on a table before the spectator who could see no hint of the tube that not only brought the oracle's voice into the chamber, but also carried the astonished visitor's questions to the confidant's ear at the far end of the tube which emerged in the room below. While it's obvious these devices did not constitute true speech synthesis, they clearly demonstrate a desire to harness the god-like power of speech and to further bend it to mortal will. As you know, it was the electronic age that finally granted these ancient wishes.

There are lots of other interesting stories about acoustic speech synthesis... the development of the "vox humana" (human voice) organ stop, Bishop Wilkin's studies of speech sounds in the 17th century, Kratzenstein's Russian work with free-reed resonators based upon dimensions of the human vocal tract (1769), von Kempelen's wondrous talking machine (1791), the Willis experiments with uniform tubes (1829), Wheatstone's speaking machine (1837), the famous work of German physicist Helmholtz whose study of spherical resonators shed new light on the nature of formants, Potter's creation of vowel sounds by means of an India-rubber globe vibrated by a reed (1873), Alexander Graham Bell's study of vowel peculiarities, R.J. Lloyd's discovery that vowel sounds are due to the relative intervals *between* resonant vocal frequencies (1896), and D.C. Miller's Fourier analysis, by mechanical means, of vowel waveforms as well as his synthetic vowel production with organ pipes (1916). All of these endeavors were wonderful explorations into the nature of the voice, and I would strongly encourage all acoustic instrument builders to seek out Wolfgang von Kempelen's diagrams of his speaking machine, along with Paget's and Wheatstone's as well. Within these plans I'm sure there are fantastic contemporary instruments waiting to be built.

In 1937 the Bell Telephone Laboratories unveiled an experimental musical instrument that brought speech synthesis into the modern realm. No, it wasn't viewed as a musical instrument, but a musical instrument it was nonetheless. Known as the VODER (Voice Operation DEmonstratoR), and built using standard telephone equipment, the device was able to speak with amazing clarity under the control of its single operator. Through a combination of piano-like keys and foot pedals, the "vodist" was able to affect the necessary changes upon mixtures of tone and "noise" in order to create very convincing synthetic speech. As with the musical synthesizer, similar control over envelope, voice mixing, filtering, and pitch were possible from inside the wrap-around instrument panel. With lines borrowed equally from classic roadsters of the day and War of the Worlds Martian spaceships, it was an impressive apparatus to behold. (Those interested can view it for a brief moment in the movie *Gizmo*, available at a few video stores).

Since Homer Dudley's invention of the VODER, speech synthesis has matured to the point where entire systems are now housed within single integrated circuits whose size is more determined by handling needs than by electronic requirement. During this evolution a breakthrough product was responsible for introducing speech synthesis to the masses, and although now rather antiquated by the explosion of higher-tech designs, it still provides a simply incredible target for circuit-bending. You've probably seen it stashed beneath abandoned "Mr. T" notebooks at the junk shop. Thousands of years of dreams and experimentations interlock within the plastic confines of this device, Texas Instrument's revolutionary talking educational toy, the SPEAK & SPELL.

The SPEAK & SPELL product line eventually included other voice synthesizers ... the SPEAK & READ, the SPEAK & MATH, the SUPER SPEAK & SPELL, and a few more not as well known. Circuit-bending the SPEAK & SPELL series brings forth a sonic landscape that in its diversity is nearly indescribable. The circuit-bent SPEAK & SPELL, with its headphone output feeding an amplifier or reverb unit, is capable of producing sounds and frequencies that will rival any synthesizer in existence. Its signal-to-noise ratio is better than countless well-accepted electronic instruments, and the unpredictable nature of its endless voicings provides the experimental musician with new material every time the ap-

paratus is turned on. The concept of such an instrument has always intrigued me. Before polyphonic micro-processor-based keyboard synths were common, I spent nearly $1,000 building one in order to be able to write programs based upon pseudo-random variables hoping to produce a machine that would always surprise me with highly variable sound-forms and automatic composition. Not that it didn't have its own rewards in other areas, but within the world of sonic eccentricity it, like most other synths, simply can't touch the modified SPEAK & SPELL.

There are no hard-and-fast rules for circuit-bending a SPEAK & SPELL (circuits were continually updated, and other than the remaining stock of SPEAK & MATHs that I recently bought-out at a department store, even circuit boards under the same name presented different circuitry as the models evolved), but anyone who gives it a try with any device in the series will probably uncover the following effects.

1) The operating rate of the circuit can be sped-up or decreased with the addition of potentiometers. This modification can slow the voice down to the point of sweeping electronic growls, fascinating in their frequencies and wave forms. Such circuit-bending points can be found by pressing finger tips across printed circuit traces. (Low voltage circuits containing no large capacitors or step-up transformers/circuitry only! See cautions in first article, EMI Volume VIII #1, Sept. 1992.) You'll discover points that will raise or lower the pitch as the current flows through your flesh. A potentiometer of the correct value (experiment) will increase this range. These points can also be extended to larger body-contacts mounted on the unit as in the chrome spheres at the bottom of the model shown (see photo).

2) Several points on all boards can be shorted to each other sending fractured digital streams of information back into areas where such were never ever meant to be. Two categories emerge, one having abstractions mixed with words, and one of pure abstractions with no wordings at all. The abstractions are vocal computer gibberish... chains of vowels, consonants, multi-phonemes, and computer tones. These chains can last for a few seconds or in some cases go on and on as the ROM, RAM, and lattice filter collide within the figure-8 racetrack of circuit-bending. Slowing this digital insanity down with the aforementioned speed control is like having an outlandish sonic microscope to explore sound with. The results are intriguing. Circuit-bending points that incorporate words may also invite ridiculous phrases. One of my modified SPEAK & READs, in a voice that sounds like an intoxicated Jack Benny, is in the habit of saying "Let's smell the scissors s'more."

3) Perhaps the most interesting composition-viable bending points are those that create a loop function. The digital stream of information (1200 bits per second) is interrupted, the results of this being different each time, giving the instrument the unpredictability and endless effects as mentioned earlier. If the loop function is switched on in the middle of a word, the result is not the simple sustained phoneme you might expect. Instead, a wild course of sonic events ensues, looping endlessly until released by the same switch. Some of the sounds are indescribable, but an example might be: "Ayy" – bell sound – pitch sweeps – "oh" – metal crash – bubble sound. The whole thing then repeats. Loops can be set within abstract voicings as well as within wordings, and they can also be slowed down with the potentiometer exposing even more surprising hidden sounds. Circuit-bent SPEAK & SPELLs are audio adventure wonderlands, each foray with its own rewards.

Due to the mysterious, phoneme-punctuated, chant-like voicings, I call these modified devices INCANTORS, as in incantation. Listening to these phrasings I imagine spells being cast, magic ceremonies being danced, sorcery and enchantments being woven through cabalistic rites. With this in mind, I've recently completed a recording of experimental music consisting of nine movements performed entirely on INCANTORS, each piece reflecting an historic ritual and botanic sacrament. The recording is called THERE IS A SECRET GARDEN, and touches upon various events ... from Shakespeare's mention of Macbeth's three witches' "slips of yew silver'd in the moon's eclipse" to the god-narcotic SOMA of India's early Hindu writing, the Rig Veda. Conceptually, the recording is meant to underline the fact that many cultures have been shaped by botanical exploration, and that responsible behavior in these areas is all too often curtailed by the current atmosphere of "substance abuse", resulting in the continual diminishment of an individual's access to the planet's gifts, from the native American's freedom to practice ancestral religion to the AIDS patient's right to possess the medicine of personal choice.

(Continued next page)

*Circuit-Bending refers to the process of creative short-circuiting by which standard audio electronics are radically modified to produce unique experimental instruments. A further description of these techniques can be read in EMI Volume VIII #1, Sept. 1992

Left: INCANTOR – circuit-bent modern "Speak & Math" with body contacts.

Rigth: More INCANTORS – circuit-bent human voice synthesizers. From left to right: modified Speak & Read, Speak & Spell (original 1979), and Speak & Math.

Procedurally, the practice of circuit-bending has much in common with theories of chance such as those applied to music by John Cage and others. These theories are meant to scale walls so that greater vistas might be beheld. We find that as it is in botany it is also in music as well as in circuit-bending, that there is a secret garden.

Further information on talking machines can be found in R. Linggard's fascinating book **Electronic Synthesis of Speech** published by Cambridge University Press, as well as Nelson Morgan's clever and thorough writing **Talking Chips** published by McGraw-Hill.

The author will accept assignments to construct any of his devices covered in EMI, circuit-bent or original, although availability of specific electronics for bending is often uncertain. Contact Q.R. Ghazala at Sound Theater, ECHO 241, 7672 Montgomery Rd., Cincinnati, Ohio 45236.

THERE IS A SECRET GARDEN, the 60 minute recording mentioned above, is available through Sound THEATER for $8.00, including postage.

Computer assistance by Tony Graff, painter and fine artist.

NOTICES

LEONARDO JOURNAL is published 6 times a year, including an annual Leonardo Music Journal. We seek subscribers ($65, c/o MIT Press, 55 Hayward St., Cambridge, Mass 02142-1399, USA) and seek composers and instrument builders interested in writing about their work (672 South Van Ness, San Francisco, CA 94110, USA). Our latest issue featured CD "Interaction: New Music for the Gamelan" and articles on experimental musical instruments sometimes based on the use of the computer, and music performance in unusual contexts or formats.

FREENOTES — Beautiful Music Made Simple. Freenotes are bar-per-cussion instruments that make playing music easy for anyone. Designed during a two-year residency with the Paul Winter Consort, Freenotes are useful ensemble additions as well as first instruments for beginners. Priced from $165.00. For info call or write: Richard Cooke, P.O. Box 1492, Moab, UT 84532, (801)259-4411.

PLUCK is a newsletter devoted to the Jew's harp. Subscriptions are $10/year (3 issues) and help support the annual Sumpter Valley Jew's Harp Festival. Free sample available: POB 14466, Seattle, WA 98144. Please make checks payable to Gordon Frazier.

MUSICAL SAW PICNIC & MUSIC FESTIVAL at Roaring Camp & Big Trees, Felton, CA (Near Santa Cruz), Sunday, July 18, 1993 10:00 AM — 6:00 PM. ALL MUSICIANS INVITED! For information call: Charlie Blacklock (510) 523-4649, or write: 1821 St. Charles St. Alameda, CA 94501.

European Art Academies Biennal takes place at Maastricht's College of Higher Vocational Education, Maastricht, The Netherlands, May 25 to 31 1993. Within the framework of this event, Stichting Intro (foundation and podium for contemporary music in Maastricht) plans to present large sound objects, sculptures and installations, an exhibition of small sound sculptures and a number of concerts. For information: Stichting Intro, St. Maartenspoort 2 6221 BA Maastricht, The Netherlands.

Furnitures, a bi-monthly journal, seeks submissions of scores, short essays, etc. in the following areas: indigenous musics of North America, soundscapes and ecology, sound poetry, text-music theory. Include SASE for return. We also review recordings. Send to: Mark Nowak, 227 Montrose Place, Apt. C. St. Paul, MN 55104.

COMPANY WEEK 93 will be at THE PLACE THEATRE, London on July 20-24. Five nights of improvised music by musicians from various parts of the world. For information call: Alan Wilkinson 081-809 6891, Nick Couldry 0865 516929 or write: INCUS, 14 Downs Road, London E5 8DS

THE TUNING OF THE WORLD, the First International Conference on Acoustic Ecology, will take place August 8 - 14, 1993 at the Banff Centre for the Arts. For information write the Conference Registrar, The Tuning of the World, Banff Centre for the Arts, Box 1020, Stn. 28, 107 Tunnel Mountain Drive, Banff, Alberta, Canada, T0L 0C0.

Just Intonation Calculator, by Robert Rich and Carter Scholtz. A composer's tool for just intonation. Internal sound for tuning reference; microtonal ear training; shows modulations; reduces fractions; converts between ratios, cents and Yamaha tuning units; MIDI tuning dumps for many brands of synths, and supports MIDI tuning dump standard; includes dozens of tunings. Requires MacIntosh and Hypercard. Only $10.00. Soundscape Productions, Box 8891, Stanford, CA 94309.

Call for submissions: "Amalgamate Sound 1993", to be printed Fall 1993, a book of scores by contemporary composers, eclectic in style & instrumentation. Submit scores before May 20, 1993, to John Frank Keczmerski, UCSD, 9450 Gilman Drive #920601, La Jolla, CA 92092-0601.

MICROTONE GUIDE. 34 page booklet of microtunings for synthesizers or new instruments. Ethnic, historic, just, and equal tunings. Good sourcebook for beginning microtonalists. $7.50 to C. Fortuna, 1305 Hartrick, Royal Oak, MI. 48067

Sale! SCRATCH MY BACK: A PICTORIAL HISTORY OF THE MUSICAL SAW AND HOW TO PLAY IT, by Jim "Supersaw" Leonard. Prepaid $15 per book; U.S. dollars; includes mailing ($22.95 value). KALEIDO-SCOPE PRESS, Janet E. Graebner, 28400 Pinto Drive, Conifer, Colorado 80433-5309.

IBM CLONE FREEWARE for JUST INTONATION. Freestanding program calculates just modulations/demodulations/intertones/complements, as well as string positions and ratio to cents. Menu driven, includes source code. Send formatted disk 51/4 or 3.5 inch, one dollar return postage (suggested) or trade material. NOVOSONICS, RFD 1 Box 312, Contoocook, NH 03329.

QUARTZ CRYSTAL "SINGING" BOWLS", frosted and clear in 12 sizes, in all musical notes available — magical — powerful healing tools for medita-tion and stress elimination, balancing energies, etc. Also available: hand-held square drums, hoop and dance drums as well as water and ceramic kettle drums, various types of RAINSTICKS, melodious chimes, bells, cymbales. Largest distributor, lowest prices. The CRYSTAL STORE 1-800-833-2328.

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CASSETTE TAPES FROM EMI: $8 per cassette for subscribers; $10.50 for non-subscribers. Prices include postage for U.S., Canada, Mexico air, and overseas surface rate. In California add 7.25% sales tax. For overseas air add $20%. Each tape contains music of instruments that appeared in the newsletter during the corresponding volume year, comprising a full measure of odd, provocative, funny and beautiful music. Volumes II, III, VI and VII remain available; volumes I, IV and V are now sold out. Order from EMI, Box 784, Nicasio, CA 94946.

EMI needs someone to write occasional book and/or video reviews. Flexible hours, lots of fun, no pay except for a free subscription. A generalist's background in the subjects EMI deals with (acoustics, music theory, instruments both historical & contemporary, stupid jokes, etc.) will be helpful, but, since the topics to be covered will be wide ranging, a willingness to make the effort to become informed about an unfamiliar topic will be just as important. Call Bart at (415) 662-2182 or write PO Box 784, Nicasio, CA 94946.

WIND INSTRUMENT TONEHOLES

Part 2

By Bart Hopkin

This is the second half of our article on tonehole placement and design, and the final installment in EMI's series on air column wind instrument acoustics. Part 1 of this article appeared last issue (Volume VIII #2), and earlier articles on air column acoustics appeared in EMI Volume VII #4 and 5.

The first half of this article discussed toneholes primarily from a theoretical point of view. The remainder will be devoted to practical aspects of tonehole making -- how to add toneholes to a tube, and make them do what they're intended to do, as leaklessly as possible.

SOME PRELIMINARY NOTES ON THE TONEHOLE TUNING PROCESS

If you follow an accurately-tuned prototype very closely, you may be able to make a well-tuned wind instrument without having to fine-tune your toneholes after the initial drilling. If you're not following a prototype, then chances are very good that you will have to fine tune. I discussed the rules for tonehole tuning adjustment in the first half of this article. In briefest form, they are: to raise the sounding pitch at a given hole, enlarge it or make it shallower. To lower the pitch, reduce the hole size or increase its depth by adding a rim around it. The fine tuning process is one of playing and listening for pitch, making corrective adjustments to the hole, playing and listening again, and making adjustments again, until you are satisfied that you hear the pitch you want to hear.

One of the difficulties in the process is that the sounding pitch for most wind instruments can deviate considerably depending upon playing factors related to wind pressure and embouchure. If your embouchure is inconsistent from one pitch-testing toot to the next, then you don't get consistent data on which to base your tonehole tuning adjustments. To make matters worse, wind players have an unconscious tendency to try correct an out-of-tune sounding pitch through embouchure adjustment. This means that you tend to sabotage your own test blows. To counteract this, you can either 1) endeavor to cultivate a perfectly consistent embouchure for pitch testing purposes, and along with that, a perfectly objective ear; or 2) see if you can manufacture a dependably consistent blowing machine for pitch testing purposes, closely matching typical human breath pressure and embouchure.

If you're tuning to a prescribed scale (rather than simply following the preferences of your ear), it's helpful to have an electronic tuner. Quartz tuners have improved in usability and quality in recent years, and they've become more affordable. Their pitch readout functions (using either LEDs or meters -- very easy to read) are well suited to the sustained tones and harmonic timbres of wind instruments.

MAKING THE HOLES

You can make wind instrument tone holes by drilling or burning. Burning, of course, is an option only for wind instrument bodies made of burnable materials. Makers working with bamboo often use burning, because bamboo splinters or splits easily under drilling. A practical procedure for burning is: choose an appropriately-sized drill bit (here serving not as a bit, but as a poker), and provide it with a sturdy, non-heat-conducting handle such as a file handle. Use a propane torch or other available means to heat the end of the bit red hot. If possible, insert a close-fitting wooden dowel into the instrument tube -- this will prevent burning the back wall of the tube and also reduce tear-out on the inside when the bit pokes through. Apply the poker to the appropriate spot on the tube, and patiently burn your way through. You can further enlarge or reshape the hole by applying sideways pressure with the hot bit. Clean away carbon and other residue with alcohol. The inside of the bore can be cleaned and de-burred with steel wool and a dowel. Smooth and round the hole edges, inside and out, with fine steel wool, emery paper, and/or a fine riffling file.

If you drill the holes, many of the same procedures apply. Insert a close-fitting dowel if possible before drilling to reduce tear-out and prevent marring the opposite side of the tube. After drilling, remove burrs by bulldozing through with the dowel pushing steel wool. With plastic and some metal tubes, some drilled out material often protrudes into the tube at the edge of the hole. Sometimes this can be removed by breaking it out as you push through with the end of the dowel alone (omit the steel wool for this purpose). For later enlarging or reshaping of the hole you can go to a larger bit, or a small burr bit or grinder bit. Be sure to round the hole edges to reduce turbulence.

Enlarging holes is easy. Reducing the size of a hole which has been made too large is another question. A temporary measure is simply to cover part of it with sticky tape. With ceramic instruments you can backfill a too-large hole by replacing some clay. In other cases some sort of filler is called for. I have found nothing better for the purpose than autobody filler. It's strong, it bonds well to most materials, and it forms a hard surface which naturally evens itself out as it dries. For backfilling substantial areas, where the filler would tend to creep into the tube as it dries rather than holding its position, go with the close-fitting dowel again. Grease or wax the dowel, and slide it into the tube. For good measure, grease or wax again the portion directly under the hole. Then fill over it. It will support the filler in the right shape. The wax prevents sticking when you remove the dowel after the filler has dried. With this technique you can even completely cover a misplaced hole.

Drawing above: An idioglottal single reed instrument with square toneholes, made by burning and then trimming. Drawing by Robin Goodfel-

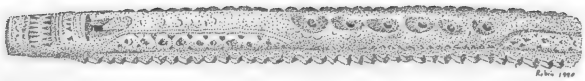
HOLE SHAPING AND PLACEMENT; ERGONOMICS

Tonholes to be played by the fingers should be made with the human hand in mind. Awkwardly placed toneholes make for awkward playing, and they contribute to leaks which undermine the tone of the instrument. When possible, locate the holes at the spots where the fingers naturally fall when the instrument is held comfortably. Offset some of the toneholes a bit to one side, rather than having them all in a line along the top of the instrument, if that puts them better in line for the fingers.

You can make a large-ish tonehole more coverable by shaping it correctly. Rather than round, make it slightly oval, with the long dimension in the direction from which the finger approaches it. As discussed in the first half of this article, you can also create an effectively larger hole without actually enlarging aperture size by undercutting (removing material from underneath the rim of the hole on the inside). With similar effect, you can make a concave seating for the finger on top (thus reducing hole thickness).

SEEKING THE LEAKLESS SEAL

This cannot be over-emphasized: leaks around the toneholes can be the downfall of any wind instrument. Commercial wind instrument manufacturers go to great ends to design their toneholes and keying mechanisms so as to reduce the likelihood of leakage, and the measure of a good wind instrument repair person is his or her ability to detect and eliminate the smallest leaks. One tiny leak may have only negligible effect on playability, but



Above and right: A flute body with depressions around the holes to accomodate the fingers, and one with raised rims to provide a leakless, level surface.

leaks have a way of multiplying, unnoticed, for a cumulative effect that soon becomes most definitely noticeable.

And leaks can be hard to find. A helpful leak detection tool is the leaklight. A leaklight is simply a tiny electric light mounted at the end of a flexible probe. Insert it into the tube of a wind instrument, turn it on and turn the room lights off, and you can get a pretty good idea of which fingers or pads are not doing their job. Where you see light slipping through, there's a leak. You can purchase a leaklight from band instruments repair supply or school music supply places. Or, if you enjoy doing this sort of thing, you can purchase the components and make a little battery operated light yourself. The trick is to fit the component parts into a very small streamlined casing, free of sharp corners or any protrusions that might catch somewhere and damage the interior of the instrument. You'll also need to design the probe mounting, complete with the electrical wires, in such a way that it holds the light reasonably steadily, yet easily bends around corners.

HOLE RIMS AND KEY PADS

A key factor in the fight against leaks is the rim of the hole, where the finger or pad rests. The surface surrounding the hole must be smooth and free of grit, bumps or irregularities. For finger-covered holes, if the tubing material is thick enough, it sometimes helps to make a small rounded concavity around the hole, the better to accommodate the shape of the fingertip, as in the picture above. Alternatively, making a raised rim around the perimeter can improve the seal, whether pad or finger covers the hole, as the narrow rim sinks slightly into the flesh or pad. Such a rim can be made any of several ways: 1) It can be carved directly into the surface of the tube. You can do this using a specially-shaped drill bit, which you can make by reshaping an appropriately-sized spade bit with a file or at a grinder to the shape shown in Figure 1. 2) The material of the tube can be somehow raised to form a rim. This is done with a lot of commercially made metal instruments like flutes and saxophones. 3) You can add something ring-shaped to the perimeter of the hole. Rubber 0-rings (available in a range of sizes at hardware stores) work well; so do short sections of thin-walled tubing. This approach works best over a hole in a flat surface rather than the round exterior of a tube. Rarely, with an exceptionally large hole, you might choose to rim the hole with some softer material that will act more effectively as a leak-proof gasket, such as a thin strip of closed-cell neoprene foam rubber weather stripping (Figure 2). 4) You can build up the rim using some sort of filler material. I have found that autobody filler (again) works wonderfully in this application for finger-covered holes. It evens itself out as it dries and forms a very comfortable seating for the finger. It also reinforces the rim of the hole in cases where the tubing material may be weak. On some types of tubing it even looks sort of nice, in a gloppy kind of way.

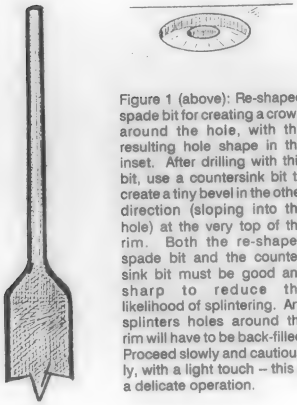


Figure 1 (above): Re-shaped spade bit for creating a crown around the hole, with the resulting hole shape in the inset. After drilling with this bit, use a countersink bit to create a tiny bevel in the other direction (sloping into the hole) at the very top of the rim. Both the re-shaped spade bit and the countersink bit must be good and sharp to reduce the likelihood of splintering. Any splinters holes around the rim will have to be back-filled. Proceed slowly and cautiously, with a light touch – this is a delicate operation.

A few words on a related topic just touched on above: On most standard woodwinds, holes that are to be covered with pads have their rims made level, rather than following the curvature of the tube wall. That allows a flat keyhead and pad to cover the hole. The flat rim may be helpful for finger-

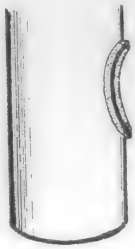


Figure 2 (left): Neoprene rubber weather strip rim around a very large diameter hole on a large diameter tube (imagine that the tube pictured is 4" in diameter). With the aid of the soft gasket the player can do a good job of covering the big hole with his or her whole hand. Without the gasket, the hand-covered hole would inevitably be pretty leaky.

covered holes on narrow tubes, as well. With thin-walled tubes the leveling can be done by creating a raised rim with a level top. On thick-walled tubes, it can be done by cutting into the tube wall surface to create a level rim within a larger concavity around the hole (as with the special drill bit mentioned above). An alternative to leveling is to make the head of the key and its pad curved to follow the contour of the tube surface. You can do this using a circular cut-out section from a slightly larger diameter tubing for the head of the key, as in Figure 4 F. This approach is more prone to leakage (being more exacting in terms of fit), but it may occasionally still be the most practical method, particularly on extraordinarily large diameter instruments. Yet another approach, which I have found practical in some cases, is to start with a square tube, which has level surfaces to begin with.

If something other than a finger is to cover a tonehole, that thing needs something of the finger's soft, fleshy quality in order seat itself leaklessly over the hole. That's why tonehole keys have their heads padded on the underside. The thicker and softer the pad, the more readily it absorbs irregularities in the hole rim, and compensates for any misalignment in the angle at which the pad comes down over the rim. But the surface of a soft pad also contributes to damping, and when there are many soft pads of large surface area covering the holes, it undermines tone quality. Some compromise is in order between a hard pad which doesn't add so much damping and a soft material that will seal well.

You can purchase keypads ready-made in a wide range of sizes for one or another of the standard woodwinds from the manufacturers. Alternatively, you can make your own pads from felt, thin sheets of soft rubber or foam, or whatever else seems to serve the purpose. To reduce damping on large pads, give the pad a hard center by fitting an appropriately-sized washer, thumbtack or similar thing in the middle. The hard center should be small enough that it doesn't interfere with the seating of the pad over the rim.

TONEHOLE KEYING SYSTEMS

With instruments on which the toneholes are too large and too far apart for the fingers to cover, it becomes necessary to create a system of pads and levers. Making simple levers to cover an unreachable hole or two on a moderately-sized instrument isn't too hard -- it only requires a little mechanical ingenuity on the part of the builder. But what about something on the level of, say, a tenor sax, with its convoluted system of levers and pads controlling every last tonehole? This requires a degree of sophistication in metal work that is beyond the reach of most home workshops. Nonetheless, here are some practical notes on wind instrument keying systems for home builders.

Elements of a typical tonehole key are 1) the head of the key, usually flat and round and slightly larger than the hole, made to close down over the hole; 2) the pad, covering the underside of the head and allowing the head to seal silently and leaklessly over the hole; 3) some sort of arm or lever, holding the head at the end, which may incorporate a pivoting or fulcrum arrangement; 4) some kind of spring to keep the key open or closed, as the case may be, when not activated by the player.

It is essential that, with all these parts working together, the key dependably comes down squarely over the hole. Any tilting or misalignment virtually assures that there will be leakage. The components, for this reason, must be sturdy, well-designed, and made to close tolerances. In short, tonehole key making in all but the most rudimentary applications is a difficult and exacting business; that's why casual home builders don't often get into it. It's remarkably difficult to create a mechanism that can effectively do what the bare fingers do quite easily.

Let's look more closely at some of the mechanical considerations that go into key design and construction.

Local vs remote playing action: One of the purposes of tonehole keys is to cover and uncover holes beyond the reach of the fingers. This is usually done through some sort of lever or pivot action. In other cases the hole may be within reach of a finger, but too large for the finger to cover. Then the purpose of the key is to provide a large key head to come down over the hole. In this second case the player usually presses directly down on the key head to close the hole. This issue feeds directly into the question of --

Default open vs default closed: You can make tonehole keys that automatically remain closed down over the hole until the playerlifts them through the key action, or keys that remain open until the player presses them down. Which is preferable depends on various circumstantial factors relating to the particular instrument. For remote keys, default closed keys are generally easier to make, through a simple lever action. For keys designed to cover large holes falling directly under the

LEONARDO TURNS A CONCEPTUAL CORNER

Longtime readers of **Experimental Musical Instruments** may remember a review that appeared five or six years ago in these pages, on a book called **Leonardo Da Vinci as a Musician**, by Emanuel Winternitz (New Haven: Yale University Press, 1982). The book is a study of an aspect of Leonardo's life that, in all the mountains of literature on the man, has gone largely unrecognized. Leonardo was indeed a musician; his peers respected his skills as an improvising instrumentalist (probably on the lira da braccio); and his notebooks contain quite a few instrument designs -- most of them, apparently, never realized.

One of the notebook sketches touches on the subject of tonehole keying design. Here's what that earlier review said about it:

"Another drawing depicts what seems to be a reed instrument or flute, and beside it what clearly is a lip-buzzed brass instrument. Both look fairly normal but for the presence of another pipe parallel to the main one, with pairs of lines drawn at intervals between the main and secondary pipes in each case. On the second pipe of the trumpet there is an ambiguous detail showing a row of tiny rectangles. Working from Leonardo's fragmentary notes and the drawings themselves, Winternitz comes up with this interpretation: The set of rectangles represents a tiny keyboard. The second pipe is not a sounding pipe, but a conduit for a mechanism for opening and closing pads over the tone holes, perhaps operated by wires and springs. It must be remembered that these sketches were done several centuries before the work of Theobold Boehm; wind instruments of the day had at most a very few pads and levers, and the problem of getting acoustically correct toneholes within the reach of the fingers remained a great bugaboo in woodwinds and brass alike. Instead of envisioning the labyrinth of keys and levers we now see on the orchestral woodwinds, Leonardo devised a completely different system -- a remarkably simple, flexible and rational one. But the instruments apparently never were built, the history of musical instruments took its course, and woodwinds now, instead of having keyboards, have dozens of exposed mechanical fingers."

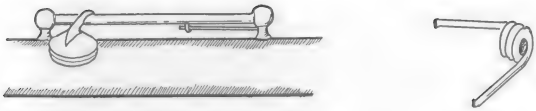


Figure 3 (above): Springs to return tonehole keys to their default positions.

Left:: Needle spring on a long pivot key. Right: Clothespin-style spring.

You can manufacture either type to suit your needs, using spring tempered steel wire, better known as music wire or piano wire. Music wire is available from hobby shops and piano supply outlets in a finely graduated range of diameters. Use thicker wires to make stiffer springs. In manufacturing springs, always use enough wire to spread the stress broadly when the spring flexes; don't create a situation in which a short length of wire must bend more than a small amount. This means that needle springs must not be too short and should not be called upon to flex more than a very short distance -- no more than, say, 1/8" of lateral flex for a 1" long spring. Similarly, clothespin-type springs will need to incorporate several coils if they are expected to flex through more than a few degrees of rotation. Figure 4 C shows a clothespin-type spring mounted under a default-closed key.

fingers, it's easier to make default open keys having no fulcrum, which the player simply presses down to close.

Springs: Whatever the default, some sort of spring must be in place to return the key to default position when it's released. Very stiff springs improve the seal on default-closed holes, but they make the playing action more difficult. The ideal is to use a moderately soft spring with perfect key alignment for a leakless seal. Commercial woodwinds usually use needle springs -- straight sections of spring-tempered steel wire (music wire), typically about an inch long, rigidly mounted at one end, with the other end pressing against a catch somewhere on the key lever to push it in the desired direction (see Figure 3 A). You may come up with a design in which coil springs do the trick, or one which uses clothespin-style springs (Figure 3 B and 4 C). For default-open keys, you may be able to make the spring and the arm which holds the key over the hole one and the same, as in Figure 4-A. A less elegant but very workable approach is to use some sort of elastic banding to pull the key lever back one way or the other, as in Figure 4 E and F. If you do this, don't use rubber bands. Left under tension, they deteriorate rapidly. Use elastic cord or strap such as are sold at fabric stores, with many rounds of elastic under light tension rather than fewer rounds under high tension.

Fulcrums and Pivoting Mechanisms: Many key designs use some sort of lever arrangement. Commercially manufactured woodwinds make extensive use of long pivoting rods, similar in concept to that shown in figure 3 A. This and other arrangements are not hard to design, but to make such tiny but strong metal components with the required degree of precision is a daunting task for anyone other than a skilled machinist with a full complement of tools. So is the attachment of such mechanisms to the instrument tube as firmly as the situation demands. Figure 4 A - F shows some possible key lever designs in rougher, more homemade sort of style. If you're a real tinkerer and junk collector, you may be able to scrounge some workable key lever hardware components from old instruments or other small mechanical items.

Compound Actions: On many commercially manufactured woodwinds, the keying actions are mind-bogglingly complex. They're designed so that a single action of the player's finger results in multiple tonehole actions up and down the instrument -- press down one key, and several different holes open or close. Long pivoting rod actions like that shown in Figure 3 A work well in applications like this, because you can arrange for arms extending out from different points along the pivot rod to fulfill various functions. Once again, while it might be an enjoyably challenging exercise to design complex actions like this on paper, the job of building one from scratch is a lot to ask of anyone but a skilled machinist in a well-equipped shop. You've got to admire the manufacturers who produce such fine mechanisms within the narrow tolerances called for.

Figure 4 (below): Some possible tonehole keying mechanisms. Notice that on each of these except the last, the rim of the hole must be made flat to accommodate the flat key and keypad.

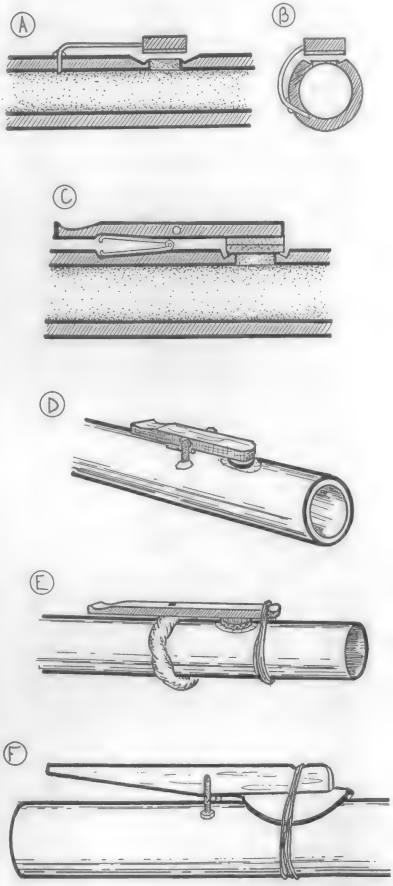
A: A default-open pad for covering large holes, in cutaway view.

B: Similar to A above, but this arrangement (shown in cutaway view, end-on) requires less space along the tube.

C and D: Two views of a default-closed system, using a clothespin- style spring beneath the key. The key pivots on an inverted U-shaped support, fixed to the tube by soldering, gluing, tapping into a very snug hole, using nuts (if bent threaded rod is used for the support) or whatever other means presents itself.

E: A default-closed key arrangement for use where the tubing material isn't suitable for drilling into or soldering to.

F. A curved keyhead, covering a hole in the curved surface of the a tube. The curved head is cut from a tube of slightly larger diameter than the instrument tube.



One thing that should have become clear from the two halves of this article is that there is a great leap in difficulty of construction between a simple six-hole flute and a many-holed woodwind requiring a tonehole keying system. To anyone who makes that leap -- especially to any layperson who has the tenacity to undertake it in a home workshop -- I say, good luck and more power; you have my respect. But I also say, to whomever happens to be listening, remember that the simplest instruments are often the most beautiful. Maybe six finger-covered toneholes are enough.

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DON'T SUE ME, I JUST WANT YOUR SOUNDS

By David Barnes

I recently sent a recording of my work "Percussion Symphony No.1" to EMI editor Bart Hopkin, who wrote me back saying that I should write an article about the piece for EMI. I had never really considered writing for EMI because I am mostly a composer, not an instrument inventor. In fact, I don't really enjoy the process of instrument building at all. It is time consuming and often leads to injury. I guess the reason that my article is appropriate for EMI is that many of the instruments that I used for my Percussion Symphony were taken directly from the pages of EMI, and Bart suggested that it would be a nice change of pace to have an article about their uses rather than their construction.

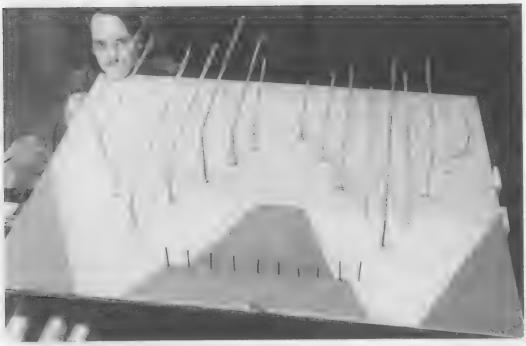
Before I discovered EMI I had been doing a lot of musical improvising with found objects, but had never considered making more complex instruments out of them. In the last year or so the instruments that I have been reading about and trying to duplicate have changed my compositional direction considerably and given me a broader palette of sounds to work with.

My styles and methods of composition vary quite a bit, but the three main genres are Rock songs, experimental improvisational recorded pieces and more "serious" works involving written scores. My rock pieces are usually first written as recorded works with myself playing all guitar, drum and vocal parts. Then they are adapted for my band Puncture Project, in which I am the guitarist/vocalist. Puncture Project plays a new brand of driven progressive funk that has received considerable recognition in Philadelphia.

My experimental improvisational pieces are written using 8-track 1/2" tape as my canvas (although I can erase mistakes more easily than a painter). I start with a couple of basic tracks, often percussion, with the assumption that I can fade them out here and there to create different-sounding sections during mixdown. I then continue adding whatever instruments come to mind. I can barely play some of them (especially the wind instruments), but it doesn't matter because I am creating a sound collage and I can get interesting sounds out of just about anything. The basic precept of this technique is that none of the notes or sounds were conceived more than a few seconds before they went on the tape. The real composing happens during mixdown when I try out various effects on the different tracks and see what Section A sounds like without the hammer dulcimer track and how it travels around a corner to Section B when the slide whistle pans from left to right and comes out of its cavernous reverb. I'm sure you can imagine that for this type of composing, having a whole new collection of instrument sounds is like being a child in a toystore with daddy's credit card. My studio is now the very best of sandboxes and I am most at home when doing these experimental tapes. I also listen to them the most often because I can learn a lot more from their unexpected coincidences of sound combination than from anything that I had completely planned out before the recording session.

I often do these improvisational compositions with collaborators and I now have a group of experienced improvisors called Bastard Finders who do recordings with me and play concerts. Our instrumentation usually includes drum set (for the dance version -- "House of Bastards"), guitars, Buchla analog synthesizer, octopads with sampler, trumpet, sax, vocals, violin, hudaki (didjeridu), and lots of percussion. I usually try to use at least a couple of the new experimental percussion instruments if they will fit on stage (most of them are quite large).

By now you must be wondering which instruments from the pages of EMI I have chosen to add to my collection. The T. Rodimba [EMI Volume VI #1, June, 1991], invented by Tom Nunn was the one that really got me started because it looked like it would sound great and be easy to build. This instrument involves a 4' by 3' piece of plywood set on a stand like a table, with full-threaded rods sticking out of the top. The rods go through holes in the board that are 6" apart and are fastened tightly with nuts. They extend anywhere from 2" to 7" above the board and bend sharply at a 90 degree angle to continue for another 8" to 36" parallel to the board. There were a few variables that Tom didn't mention in his article. I found that 5/16" thick rods were the best for most lengths, but I could get some really good sounds out of 3/8" ones if they were long enough (at least 20" beyond the bend). The height of the bend above the board makes a big difference in the sound of each rod. Longer stems will give more overtones when the stem is struck and less overtones but more bass resonance when the extension is struck. I believe that the length of rod that sticks out under the board also makes a difference, but the only thing I have determined for sure is that you need to leave more sticking out underneath for a longer stem to resonate properly



Clockwise from above left: T-Rodimba, Bass Tubulon, Trash Can Platter, PVC Monster.
Photos by Tim Baradet

(regularly they stick out 1"- 2" under the board).

The original versions of the T. Rodimba included nails, combs and strings which I found weren't loud enough to compete with the rods (for my playing style). I did however find that stretching springs between some of the rods adds a wonderful reverberance to the instrument that goes well with the steel girder sounds of the rods. I got the idea of adding springs from seeing their uses in other experimental instruments.

The next instrument that I made was the "Trash Can Platter" (with a side o' 'slaw). The original version is by Peter Whitehead [EMI Volume VII #2, September 1991], and I stuck pretty closely to his design using a trash can resonator, bike wheel and steel girder with rods going up to pan lids and platters. I found that the best mallets for both the platters and the bike spokes are butter knives. I was very pleased with this one visually and have considered entering it in a gallery show of musical sculptures.

I can't remember who I got the concept for Tubulons (steel conduit marimba) from, but it seems to be a relatively common experimental instrument.* After trying a standard xylophone structure with the steel tubes lying on many different types of padding, I found that hanging them on loops of string from a girder let them ring much more clearly. The girders don't get in the way because the tone I find most effective comes from hitting the tubes on the ends. For mallets I use 1" thick plexiglas rods with layers of duct tape around one side. During performances I have choreographed beats where two tubulon players flip both of their mallets in the air and come back in on the next beat with a completely different tone (the duct tape gives a softer tone than the bare plexiglas). I also use these mallets for the T. Rodimba.

The last idea that I copied from EMI writers was the PVC organ used by Phil Dadson and the group From Scratch [EMI Volume VI #4, December 1990]. The instrument is a tuned set of long plastic tubes, struck with a broad beater over the open end to excite the air inside at its resonant frequency. When I first read about From Scratch's idea of using flip flops to slap the ends of plastic tubes I thought this must be on the very cutting edge of experimentalism. Since then I have heard of several other groups that use the "Sewer Organ," and last month my grandmother brought me pictures she took of an isolated tribe in New Guinea that uses the same blue flip flops to slap the ends of bamboo pipes. It's all been done before!** Last year I saw a PVC organ used by "The Blue Man Group" who are part of the PS122 performance group in New York. The Blue Men's PVC organ was designed differently from the ones used by From Scratch in that they used PVC elbows to compact the size of the instrument and make it more portable since each tube can

*From the editor: Various builders have used the name **tubulons** (sometimes **tubulongs**) to refer to marimba-like instruments using steel conduit for the bars. Others have made similar instruments but called them by other names. They are popular with microtonalists, being easy and inexpensive to make, suitable for precise tuning, and stable once tuned. See Stephen Smith in EMI Volume II #1, June 1986, and Buzz Kimball in EMI Volume VI #1, June 1991

**From the editor: It should be noted that Phil Dadson and the members of from Scratch don't claim the idea as their own, and have been generous in their credit to musicians in the Pacific islands and elsewhere.

be taken apart into sections. They also designed it so that all of the non-struck tube ends face one point where you can amplify it with just one microphone. I used the Blue Man design to make two instruments – "PVC Monster" and "Bride of PVC Monster." The elbows don't affect the sound of the instruments because when the flip flop mallets slap the ends of the pipes, it compresses the column of air which is what resonates, not the pipes themselves. It is also interesting to note that the pitch is determined almost entirely by the length of the tubes. Diameter has only negligible effect on pitch. (I used 2" to fit most flip flops).

To this collection of EMI-inspired instruments I added a rack of circular saw blades, a bass hammer dulcimer (using the thickest strings of a piano), a wooden dowel xylophone (each dowel has two notes a semi-tone apart depending on what "side" you hit it on (I have no idea what causes this but it is consistent with all of the dowels that I tried), a pile of hubcaps, pots and pans, and a Kalimba shaped like an upside-down bronze bowl with spikes on the top. This last instrument is called the "Porku-hat" and was made by a sculptor/percussionist named Chris Jones who was in my ensemble. This list completes the full instrumentation for my Percussion Symphony No.1.

The Percussion Symphony was commissioned by a grant from the West Philadelphia Community Education Center where it was performed in February of 1992. I used the funding to buy all of the materials for the instruments listed above and spent about eight months constructing them. I then had only four months to write this 29-minute piece and teach it to the six percussionists (including myself) who performed it in February. I started by composing the T. Rodimba and PVC Monster parts since they set up the rhythm patterns and the bass line in the first section of the piece. I quickly discovered that regular musical notation wouldn't work for many of the instruments. The T. Rodimba rods have so many overtones that you can't put a definite pitch to each rod, and they wouldn't be in the right order if you could. Basically I decided to set each rod equal to a note on the staff in an order based on location rather than pitch. Since there are two sets of nine rods I had the left hand set be the lower staff and the other set be the upper staff, as in piano notation. I decided that I would call the clef the Barnz Clef and denote it with a "Z" at the beginning of each staff (modesty, I guess). I use this clef for any instrument where notation is based on location rather than pitch.

The PVC Monster, Tubulons and Bass Hammer Dulcimer are all in tune with each other, but they are microtonal (i.e. out of tune with Western scales). I simply put a few pluses and minuses in the key signature and didn't worry about the notation from then on. My scale was determined primarily by what length of pipes I happened to have handy for the tubulons since these were harder to tune than the PVC instruments or Dulcimer which has a moveable bridge and tuning pegs. This may sound like cheating, but I came out with a scale that I really liked, and I would have no trouble writing unison lines and octaves since the main instruments were in tune with each other.

I found I could get a powerful effect by doubling many of the bass lines on PVC Monster and Bass Hammer Dulcimer. The Bass Hammer Dulcimer sounds especially good when the contact pickups are processed through a distortion peddle. The result is one of the most industrial music sounds that I have ever heard, and the pitches can also be heard better because of the compression and enhanced overtones that you normally get with distortion units. The Tubulons are better for creating a harmonic environment or for slow melodies since they ring too long to make fast melodies audible.

My Percussion Symphony was based on some rhythmically complex patterns and some steadier ones using a Funk groove (where the T. Rodimba functions as the trap set and the PVC Monster is the bass). The complex patterns frequently go back and forth between a feel of 4 and 3, and often you realize that you changed from one to the other and didn't notice where it happened. This effect is achieved with a few tricks like using the last beat of one pattern as the first beat of another or confusing the ear with 3 against 4. At the end of the first part of the piece, for example, all six players are doing 3 in one hand against 4 in the other. Eventually the "3" hand stops and the "4" hand keeps its same tempo but starts counting 3 beats per measure instead of 4. The other hand then comes back in with a faster 4 against the new 3. This happens five or six times with a result that the piece gets faster and faster. The end of the piece uses the opposite technique with 2 against 3 to get slower and slower until it is almost unplayably slow. Most non-musician listeners don't realize that this is the hardest part to play; anyone can play fast.

The performances of this piece were a great success. We added elements of performance art using tricks like mallet flipping,sawing pieces off the bridge of the hammer dulcimer (which was very loud because the contact pickup was attached to the bridge) and pouring glass beads on the T. Rodimba and whipping it with a steel chain. The chain put some dents in the T. Rodimba, but it was worth it for the audience response. In the future I would like to do a lot more with the mallet flipping idea, incorporating juggling while striking to create an entirely different type of performance medium. I know that I'm not the first person to think of this idea and I would love to hear about anyone who has tried it.

The technical aspects of my performances were a nightmare. The instruments required a total of nine microphones and three contact pickups going into three guitar amps and two PAs. As a result, some instruments sounded more natural than others. Unfortunately I am an unyielding perfectionist when it comes to the final taped versions of my pieces, so in March I did a studio recording of the Symphony with myself playing all of the parts. It was quite a challenge learning everyone else's parts and playing them without accompaniment, but the result is a recording that I am quite happy with. It is available for $5.00 + $1.00 postage to: David Barnes, 4502 Springfield Ave., Philadelphia, PA 19143. The B side of the tape has a live recording of the Bastard Finders improvisation that was the second half of our performances in February. Other tapes by Bastard Finders, Puncture Project, and my solo exploits are also available at the same address for the same price. I will also trade tapes.

I am currently working on two new pieces using the experimental percussion. One was commissioned by the Pennsylvania Council on The Arts and is being written for string quartet, PVC Monster, Bride of PVC, T. Rodimba and drums. This will be performed in 1993 at the Dia Center for the Arts in NYC (Mercer St., Soho) on May 10th, the First And Second Church in Boston on May 19th (with Boston Symphony string players), and at the Lincoln Center Outdoor Festival (NYC) on August 18th at 6:30 (free!). The second piece is a recorded work commissioned by New American Radio for their nationally syndicated radio show. It was released for programming December 1, 1992 so ask your local college station if they carry New American Radio. If anyone wants to get further information or is coming to Philadelphia and wants to jam they can reach me at (215) 386-2461, or write to the above address.

SYSTEMS FOR NON-LINEAR INSTRUMENTS AND NOTATION

Part One

By Dan Senn

In the article that follows, Dan Senn addresses the subject of "non-linear" musical instruments. With the adjective "non-linear,", he refers to sources of musical sound that don't follow orderly prescriptive parameters of control imposed by the maker and player, but instead follow less predictable patterns based in the nature of the instrument and materials used, interactions between players and instruments, and other environmental factors. To what extent, the article asks, is it possible to create useful notation systems and meaningfully prescribed compositions for such instruments?

Dan Senn is the creater of the Scrapercussion sound sculpture series discussed in the article. The Scrapercussion instruments are built from found resonant scrap objects connected in a continuum with quarter inch steel rods and suspended around and through a PVC chassis. The instrument is designed to be danced with (the pedestal is outfitted with wheels), and played acoustically and electronically using special feedback circuits and the instrument's natural resonances.

This is the first of two parts. The second half of "Systems for Non-Linear Instruments & Notation" will appear in EMI's coming September 1993 issue.

ABSTRACT

Linear notation when applied to non-linear instruments is mutually obstructive. Take for example a soundsculpture which has been designed to link the visual and aural arts in a balanced representation – how does one score for an instrument where the pitched elements may only be a by-product of visual and timbral or even logistical considerations? ... where sound parameters do not operate along a convenient continuum? ... where traditional percussion mallets may be unsuitable and specially designed implements are required? Unlike traditional instruments where the keys are arranged in panel format for easy access, non-linear instruments often regulate their own performance (and performance practice) by way of a purposefully difficult terrain. The symbiotic nature of soundsculpture is the stuff of compromise as sounds and shapes are fixed in space on mutually inclusive terms. In these instances, the spatial position of resonant objects, relative to a performer wielding implements of a certain nature, suggest a set of physically possible or convenient musical gestures. These considerations extend beyond the limits of traditional notation and bring to the fore the question as to whether a new system should be devised in light of these geographic anomalies ... or whether, perhaps, it is best for such performances to remain within an improvisational context.

In this article, I will attend to these questions while exploring the options available to composers who would like to develop notational schemes for non-linear instruments as well as for compositions extending to other mediums. I will present various examples of non-linear instruments along with examples of notation systems which have been successfully applied to them. Within this context, I will explore the question of traditional performer expertize vis-à-vis sculptural instruments and the accompanying notation, arguing the appropriateness of performer "incompetence" in some instances. But first, through personal observation, I will relate the conditions from which I believe the conscious use of non-linearity in systems, instruments and notation became a necessity since the second world war.

THE UNCONSCIOUS IMITATOR

The question most often asked by my students after launching unsympathetically into the details of one of my composing systems, is something like, "What on earth would bring you to make art in this way?" My reply is embarrassment. Utter, total, red-faced, candid camera-like embarrassment. And for this reason, before I now go on to the subject of non-linear systems, I would like to explain the nature of this embarrassment and why I believe it is one of motivating forces behind rule-based composition (Laske 1990) and non-linear notation of the past fifty years.

I began my creative life an unconscious imitator. Coming from a working class family, my contact with contemporary music and art began at state university and mainly through books and recordings where I learned by rote the music of Hindemith and Stravinsky. My first system of composing was to imagine sounds in these languages and then to transcribed them to paper – a concept reinforced since youth by Hollywood's depiction of the inspired male composer. Forever-bound by mass-inspiration, I through-composed everything. It was not until I studied raku pottery (an aleatoric ceramic method associated with Zen and the Japanese tea ceremony (see Senn 1991) that I learned that other creative approaches existed. And it was not until I moved to an environment where contemporary music was part of the daily course, where I heard contemporary music performed live for the first time (including my own), that I was forced to re-examine my creative methods.

As a fresh-off-the-farm graduate student at the University of Illinois in the mid-1970s, I soon learned that to watch new music performed was altogether different from listening to a recording (Senn 1990). While I had seen Leonard Bernstein and others moving about on television, I had never associated this with the avant-garde. I had never before known musicians so talented that cognitive time was available to develop the dance and theatrical aspects while playing complex music. At Illinois, live, and for the first time, I was seeing musical gestures made redundant by physical gestures and the affectation produced a nervousness in me. The "dance" seemed to expose something in the music that was less than authentic and, perhaps, out of conscious control. The embarrassment was so overwhelming that it ended my creative routine.

I relate this experience because I believe that since the second world war, since the seminal pieces of John Cage, it has been an experience shared with many other composers and that it is one of the primary forces behind artists compelled to make music and instruments using non-linear systems -- artists who have been driven by the embarrassment of unintended style.

THE EMBARRASSMENT OF UNINTENDED STYLE

During the early 1960s, intermedia artist Phill Niblock specialized in taking films and photographs of dancers in New York City. He did this for several years when, alas, he became weary of the contrived nature of choreographed dance as subject matter for his films. Having been raised near the automobile parts factories of Anderson Indiana, Niblock's background was blue collar and since early childhood he had watched his father and other craftsman plying their trades with great interest and

Filmmaker Composer Phill Niblock.

Photo © 1992 Lona Foote

respect – the refined motions had been richly satisfying to his eye. Eventually Niblock's interests shifted and he began filming tradesman at work with the kind of unobtrusive skill found within the literary works of Primo Levi – a chemist by trade who also wrote wonderful books. His new work took him to areas within the United States, and then later to places around the globe wherever the density of manual labor enabled him to shoot a lot of film within a relatively short period of time.

Niblock's working esthetic was and continues to be very simple. Once an area of interest is found, the order of events is determined by the sequence in which laborers are found; editing is limited to splicing out the blank frame which is lost between starting and stopping the camera; in the creative moment (the foreground), his selection criteria is based on his child-like ability to see the refined, repetitive beauty of the laborer at work.

EFFICIENCY AND MASTERY

It is my contention that style develops out of efficiency and mastery and that style unintended is something to be avoided in art. Within our society, artists are encouraged to develop a style which will become a trademark and eventually, with some luck, a marketing tool. The ease with which students pass rehearsed actions to automatic or rote processing becomes a measure of their intelligence. This form of facile rote processing, however, tends to entrap the talented with an idleness-of-mind commonly experienced when, for example, driving a car. It is true that a conscious performer will fill this idle time with structural reflections which then feedback into the real-time automatic processing. This is the ideal. More often though, this idle time is drawn unavoidably toward showmanship – the theatrical and dance elements of style. More often than not, the idle mind discovers and exaggerates the kitschness.* of the musical style and, in time, this kitschness often replaces the substance of the art itself (Senn 1988).

Efficiency and mastery often lead to kitsch which, in turn, parades as the substance of art itself. Kitsch in art is clearly visible and audible. Kitsch unintended is not a pretty sight. Style unintended is often kitsch. Style unintended is not a pretty sight.

Again, since World War II, I believe that the embarrassment of unintended style has contributed to the interest in non-linear systems as applied to various composition and notation systems, as well as to the construction of sculptural instruments.

INTEGRATING NON-LINEAR INSTRUMENTS AND LINEAR NOTATION

Volker Staub is a German composer and instrument builder living in Cologne who inherited his grandfather's tools and workshop. He also inherited a large cache of very old and large wine bottles. From these he decided to develop a collection of bell-like instruments by removing the bottoms from the bottles. He soon learned, however, that cutting the thick and colored glass was very difficult and that tuning them was virtually impossible. The pitches and colorations could not be controlled and therefore would be a by-product of the awkward deconstruction process, and their original function as wine bottles.

Volker was in a forest near Cologne when he came upon several felled ash trees which had been stripped of bark, cut into various lengths, and had become well-seasoned over the years. He learned that by tapping the logs at various points around their circular ends, and at a few points in-between, a wide range of distinctly different pitches could be heard. These were amplified in beautiful ringing timbres by the resonance of the log itself. Volker, who was accompanied by his brother, loaded as many of these logs into their van as possible. The criteria used for selection was based on those logs which sounded beautiful, those which they could carry, and those which would fit into their van. Volker and a friend were investigating an old quarry when it was discovered that some of the discarded stones, all of which had a sharp conchoidal fracture, had distinctly different pitches and timbres when tapped in different places. Once again he decided to collect some of these stones. As before, the selection criteria was based on a mix of esthetic and logistical considerations. He took those stones which sounded beautiful, those which would fit in his car, and as many as his not-too-patient friend would allow.

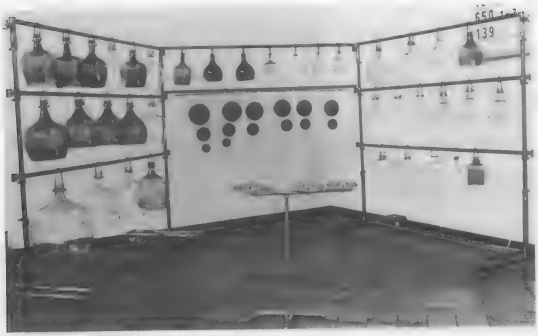
Of the instruments found by Volker, all would be considered non-linear for the following reasons. To begin, their unusual shape would obstruct access to traditional musical characteristics and strongly impact the possible rhythms and gestures

*"Kitsch" is a German work meaning "garbage." During the 1960s and 1970s it came to represent art which was gaudy or overdone, sometimes purposefully. Vintage shops were even established specializing in kitsch artifacts.

Instruments by Volker Staub in Tübingen.

Photo by Volker Staub, (1989).

Wine Bottle Instrument by Volker Staub. Photo by Volker Staub, (1988).



used in their performance. When presented, they would unavoidably carry the meaning of their non-musical origins while remaining innately resistant to mass reproduction. All were complex to the extent that they could not be considered a mere special effect – a way of trivializing unusual sounds and instruments. As with other such non-linear instruments, they are opaque in comparison with the transparent nature of linear instruments, a quality which elevates them to partnership status with composers and performers. With non-linear instruments, if you are to use them in a composition, you must be prepared to negotiate.

Volker used each of these instruments in different compositions, but the problem facing him was the same each time. How should the instruments be presented? Volker chose a method which would integrate aspects of the non-linear instruments into a linear presentation. This would allow performances by more traditional players using a notation they were more familiar with. In preparing for this, he analyzed each instrument for its pitch content and from this he developed a basic set. Many of the pitches, of course, would not conform to Western tuning systems and would required accompanying instruments to make adjustments, if possible. In pieces involving the logs (these range from one meter to several meters long), only certain pitches were available at specific locations of the log. This affected the available pitch and rhythmic material as performers could not easily span the distance between pitch locations.

Cross-mapping non-linear instruments with traditional instruments is one solution to such a composition/notation problem. And while addressing aspects of performer access, it does not take full advantage of the non-linear characteristics of the instruments themselves.

IMPROVISATION ON NON-LINEAR INSTRUMENTS USING UNTRAINED MUSICIANS

From 1988 to 1991 I was a member of the Ball State InterArts Ensemble which specialized in pieces which integrated audience members and performance environments into group compositions. The ensemble consisted of two dancers, myself, and a landscape architect with considerable skills as a dancer. For our 1989-90 season we performed a concert entitled "Camping Indoors" which dealt with dividing the traditional seating area (the chairs were mobile) into areas designated by color tape for each event. The concert program directed audience members to gather behind various color borders for different pieces. A gallery was also provided for shy audience members, but most were content to move into the areas where they served as performers and props in addition to their traditional role.

One composition entitled "Remote Sensing" was for the mobile Scrapercussion #7 (Senn 1983), dancers, live-electronics, and participating audience members. After the audience was guided into position, "mallets" were distributed along the landscape borders. Contiguous areas of audience members were handed plastic combs, fallen tree branches, wooden spoons, and straightened lengths of wire coat hangers. Once seated on the floor (folding chairs were also provided), the audience was instructed that at some point the dancers would begin moving with the Scrapercussion itself. When the instrument came near, they should rise and strike it. In this way, the dancers could play the soundsculpture by moving it against the "textured" borders of audience members. In this way, the audience would act as a random event generator while participating as co-percussionists with the dancers.

Compositions which involve the audience in such a way bring esthetic perception to an extraordinary level of intensity. They also provide an experience not easily forgotten. Indeed, a fact often missed during and after such a concert is that a composition of purely musical interest has taken place. The visual impact of the soundsculpture, the arrangement of the performance space, the distribution of "mallets" to audience members represent a real-time improvisational framework – a three dimensional score of sorts – within which non-musicians may perform. Is it music? Is it dance? Is it theater? It is not important. The "danger" here is that the audience members run the risk of the leaving the performance questioning precisely where life ends and art begins, a division well-worth obscuring.

TRANS-NOTATIONAL SYSTEMS

Since the early 1970s Stuart Saunders Smith of Baltimore has been developing notations for what he calls "trans-media collective compositional systems." Quoting from the introduction of his most recent piece using this notation entitled "Transitions And Leaps" Smith says, "I have long been moved to make art which is devoid of material – art of a universal spirit capable of taking any shape – an art of infinite potential within a finite space." In the four trans-media compositions he has written, all of which may be performed within any discipline using any combination of mediums,

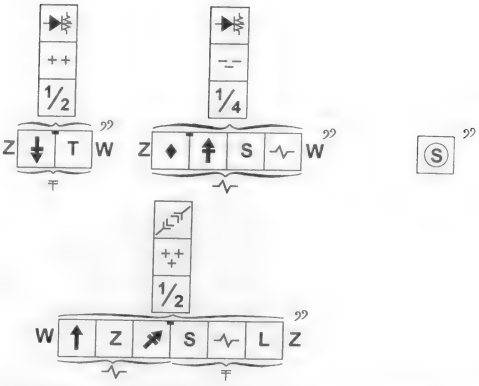
Scrapercussion #7 by Dan Senn.

Photo by D. Senn, (1991).

Smith has attempted "to establish a foundation for a general systems approach to the performing arts."

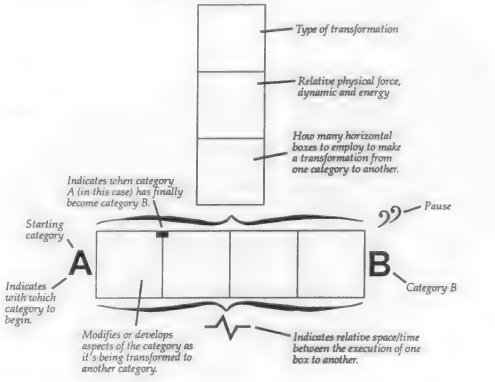
In my estimation, Smith's trans-media compositions and notation systems are purely non-linear and demonstrate how the non-linearity of a rule-based compositional process can be merged with the notation system itself. This is clear when one realizes that Smith's systems can be used away from the performance arena altogether to generate compositions scored in a linear format. This is because Smith's trans-media systems can be viewed as pre-compositional systems which allow the performer/composer (as he refers to them) to bring their personal preferences into the performance/composition environment for real-time enactment. Unlike the conceptual art pieces of the 1960s, or some of the wide open free improvisational systems used today, Smith's systems establish a rigid process of interaction which prevents both cynical exploitation and the blind regurgitation of endless improvisational trivia (also painfully embarrassing). Smith regulates the actions of the composer/performers through an ingenious system of generic intensifiers, modulators and self-referencing systems as given in the example of the "Event-Construct" to the left. Within a musical context alone, Smith's trans-media notations may be applied to linear instruments, but it is my view that they are suited best to non-linear instruments, or to non-linear applications of linear instruments (Johnston 1990).

Before leaving Smith's system, I would like to comment further on one of the most curious aspects of "Transitions And Leaps." Prior to rehearsal and performance, the performer/composers are asked to choose eight categories of actions which may be within any medium. The score itself has eight pages which may be read in sequence, but performers are encouraged to develop their own systems for reading the score within given limitations. These liberties may at first seem very broad to the extent of excluding the imprint of the composer in the final performance. While I have not seen or heard this particular piece performed, in performances of other trans-media pieces by Smith, all of which have varied greatly in their surface detail, the impression is that the notation and organizational system creates a piece which is distinct and clearly identifiable in every performance. One may also conclude that an invitation for performers to determine the surface detail of a piece is an invitation to poor taste. In my judgement, however, this systems actually cultivates bad taste (intended style?) to the extent that it becomes an asset within the performance. So long as Smith's trans-media pieces are well-rehearsed, and the compositional limitations are carefully adhered to, virtually any decisions made by the performer/composers will succeed at one level or another. A reason for this is that non-linear systems are uniquely capable of self-referencing in a live performance and that these self-observations are apparent, if only subliminally, pushing the performance into a space somewhere between art and life itself.



Above: A page from Stuart Smith's Trans-media piece called "Transmissions and Leaps." © 1990 Sonic Art Editions. Used by permission of Smith Publications, 2617 Gwyndale Avenue, Baltimore MD 21207.

Below: An Event-Construct Schematic for Stuart Smith's "Transmissions" sub-system and "Leaps" sub-system. © 1990 Sonic Art Editions. Used by permission of Smith Publications, 2617 Gwyndale Avenue, Baltimore MD 21207.

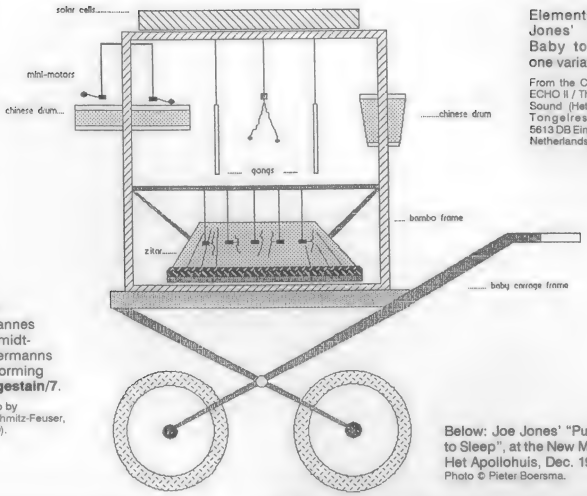


INTERACTIVE COMPUTER SYSTEMS WITH AUDIENCE PARTICIPATION

Non-linear notation may be represented by the visual interface connecting a computer program and its user/performer. An excellent example of this is Joel Chadabe's and David Zicarelli's M software which is commercially available from Dr T's software out of Boston. This program acts as a compositional framework allowing the user to create up to six different states of action probabilities as applied to a wide variety of sound parameters within as many as four separate MIDI voices. Combinations of probability states may be kept in what is referred to as "snapshots" which may also be stored separately for ready access during live performance.

In my piece "Late Takes for Scrapercussion Samples and Audience Thrown Projectiles," forty-eight samples are stored in eight MIDI keyboards for live performance using the M program. Prior to the performance, the audience was asked to throw coins at the soundsculpture which was miked and amplified along with the computer samples. These were played live using a computer mouse interacting with my re-programming of the M program. In all performances to date, the audience, which is always more than willing to throw money at art, has struck the soundsculpture at a predictable rate against which my live computer improvisations have interacted quite beautifully. This arrangement creates an unusual theatrical and sonic environment as well as an apt training ground for philanthrops of the future.

Left: Johannes Schmidt-Sistermanns performing **Fragestain/7**.
Photo by C. Schmitz-Feuser, (1990).



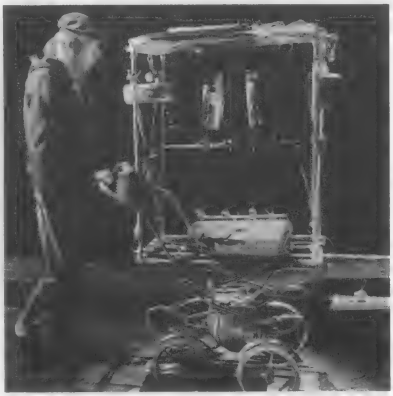
Elements of Joe Jones' "Put the Baby to Sleep," one variation.

From the CD & booklet ECHO II / The Images of Sound (Het Apollohuis, Tongelresestratt 81, 5613 DB Eindhoven, The Netherlands).

IMPROVISATION ON NON-LINEAR INSTRUMENTS

Johannes Schmidt-Sistermanns, a German composer and former student of Mauricio Kagel also collects stone instruments which he presents within a performance art context. In a recent performance at Moltkerei in Cologne, he improvised on found strips of basalt rock of about one inch in diameter which produced richly varying overtone structures when struck rapidly on alternating sides up and down the length of the strips. The pieces of rock varied in length and because they were somewhat awkward to handle (the stone instruments would have shattered if dropped), the composer/performer smartly brought the handling of the instrument into the theatrical realm of the overall composition. In doing so, the opaqueness of these curious, non-linear instruments was enriched by the performance art setting as the viewers were drawn into an intense hearing of the sound, an experience which would have been difficult to replicate using notation of any sort.

Joe Jones is an American composer living in Germany who has been building sculptural instruments for many years. A recent composition-instrument was performed at the Tenth Anniversary Festival for Het Apollohuis in Eindhoven Holland, the name of which I have forgotten. The instrument consisted of toy percussive instruments, tuned and untuned, which were struck by beaters attached to slow revolving motors on rubber bands. All of this was mounted on a child's doll carriage. Atop a make-shift roof over the carriage, Jones attached a small bank of photovoltaic cells which were used to power the electric motors. Within the gallery space (the piece was exhibited during the festival), the composition-instrument was performed by switching on a spotlight positioned over the instrument. During a concert presentation, the instrument was performed by Mr. Jones walking the instrument through a sequence of stationary spotlights which ringed the proscenium area. Between concert pieces, the composer/performer casually entered the side with his doll carriage passing through each spotlit area causing his composition-instrument to come alive with energy and sound. The piece was humorous, simple and beautifully elegant in sound and sight.



Below: Joe Jones' "Put the Baby to Sleep", at the New Music Party, Het Apollohuis, Dec. 1990.
Photo © Pieter Boersma.

Sculptor, composer and author Dan Senn has recently left his position as Associate Professor of Music Theory at Ball State University in Muncie, Indiana, to become Director of Newsense Intermedium, a nonprofit organization specializing in presentation of interdisciplinary arts. He is available for performances, installations and lectures. Two cassettes of his music are available: "Music and Texts" (1991) and "Flutter Moths" (1992). Write to Newsense Intermedium, 1933 Commerce #301, Tacoma, WA 98402. ("Music and Text" is also available in Europe under the title "Schmoos Harp Improvisations" from V2 Organization, Muntelstraat 23, 5211 's-Hertogenbosch, Holland).

References for this article appear on the following page.

Part Two of Dan Senn's "Systmes for Non-Linear Instruments and Notation" will appear in EMI's coming September issue.

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RECORDINGS REVIEWS

By Mike Hovancsek, Tom Nunn & René van Peer

AUSTRALIAN MUSIC INTERNATIONAL: **DAWN UNTIL DUSK**

On cassette from Australian Music International, 533 East 13th Street Suite 4A New York, NY 10009

Australian Music International is an organization dedicated to bringing the music, art, and culture of Australia into the international marketplace. "Dawn Until Dusk" is a document to the sounds of Australia, containing a sample of several different elements of the culture including tribal songs, didjeridu pieces and environmental recordings.

The high quality recording equipment used on this project in addition to the combination of sounds recorded in one session mixed on top of sounds recorded in another will no doubt make the purists flinch. The environmental recordings of insects and wind mixed into the background of tribal songs and the tendency for one piece of music to fade into another were obviously done to create a listening experience that takes into account the numerous sounds one would experience wandering through the villages sampled here. The result is a remarkable display of interesting sounds: voices, didjeridu, environmental sounds and tribal songs.

The main instrument featured in this recording is the didjeridu (a traditional musical instrument of the aboriginal people of Australia). Made from the limbs of eucalyptus trees hollowed out by termites, this instrument plays an important role in the Australian culture. Performed on this recording by Adam Plack and Johnny (White Ant) Soames, the didjeridu emits the unique sounds that are the personality and soul of Australian music. The buzzing bass hum is a haunting, insect-like timbre not heard from other instruments.

"Dawn Until Dusk" is not a dry, clinical document for anthropologists. It is an enchanting listening experience that is well recorded, nicely packaged and interestingly presented.

—MH

DAVID BARNES and BASTARD FINDERS: **PERCUSSION SYMPHONY NO. 1 / FRIPP GRIP - LIVE**

On cassette from BARNZSTUFF MUSIC 4502 Springfield Ave. Philadelphia, PA. 19143

These two cassettes are examples of the percussive end of David Barnes' work. On his own and with his group, Bastard Finders, David uses a wide range of instruments including several that were based on instruments featured in the pages of EMI. The long list of instruments played by David and his evolving group of musicians includes T. Rodimba, flexitone, PVC Monster, tubulon, Buchla analog synthesizer, gourds, Porku Hat, Circular blades, bass hammer dulcimer, trash can platter, octapads, hubcaps, autoharp, and guitars.

Both tapes are well recorded documents of David's vision as performed in a variety of situations (live performances, studio recordings of ensemble pieces, and multi-tracked recordings of David sans the other members of his ensemble). The composed pieces are extremely dense, lush works that develop nicely from one series of timbres to another. The improvised pieces move equally well but allow the ensemble members to step out and to express themselves more completely.

—MH

Q.R. GHAZALA: **THERE IS A SECRET GARDEN**

On cassette, from Sound Theater, 3325 South Woodmont Ave., Cincinnati, OH 45213

"There is a Secret Garden" is a marvelous cassette representing a truly unique approach to electronic music utilizing voice synthesizers found in toys. One would not know this, however, from listening to the music, as there is nothing recognizably "vocal" about it. Using a process Reed Ghazala calls "circuit bending", these modest little electronic sound generators are modified by rewiring the original circuits in experimental ways. Exactly how Reed is producing these sounds in not explained in the documentation, other than identifying the sound source as "electronically modified human-voice series". [The reader is referred to articles Reed has written in this and previous issues of EMI entertainingly explaining this process.] The results are quite unbelievable.

How much of this music is the instrument, and how much is the player? We'll likely never know ... and that's fine. Let us wonder! If music is anything, it's something to make us wonder. But it is interesting that this question comes to mind at all. Normally we can easily identify an instrument(s) within music; not here. Perhaps this is the one of the "secrets" of "Secret Garden."

Often, electronic music relies heavily on sheer color and has a somewhat "abstract" nature. In this music, however, there is a strong sense of musical flow and a titillating balance between control and noncontrol, between the abstract and the emotional. The music, though timbrally well defined in each piece, seems to move forward, giving the impression of a life force. Indeed, Reed aptly demonstrates in this music his aesthetic that instruments – all instruments – are living beings, with a life cycle and a lifespan.

Consistency of personal style is apparent from piece to piece, yet there is a satisfying variety among the pieces. Often some underlying continuous ground supports a more animate foreground character that shapes the music through phrasing that has all the earmarks of live performance or improvisation. The individual pieces have an appropriate, natural length, reflecting the composer's sensitivity to musical form and its perception. And the recording quality is superb.

One further note: The packaging and documentation of this cassette is stunning! The full color cover is a beautiful piece of art in itself, also apparently Reed's work. A man of many talents and creative ingenuity.

—TN

JERRY HUNT: **GROUND - FIVE MECHANIC CONVENTION STREAMS**

On CD from O.O. Discs, 502 Anton St.Bridgeport, CA 06606-2121

Jerry Hunt's CD, "Ground," is a collection of pieces involving traditional instruments and "mechanic music instrument arrays." The traditional instruments include violin, piano, voice and (maybe not so "traditional") cowhorns. The "mechanic music instrument arrays" are a mystery to me. There is no explanation in the liner notes, considerable though they are, of what these devices are or how they work. Suffice it to say, there is *some* connection, and possibly some cause-and-effect connection..., but I'm just guessing.

Before getting into the music, I should mention that the packaging of this CD is superb, first class. The O.O. Discs label is making a real effort to present new music in a most professional way. Three full-size fold-out pages are given to Hunt's own notes about this CD. Unfortunately, his comments tell us (me, at least) little about the music because of his very personal, highly intellectual way of expressing himself about it. Example: "These works consist of translations of derivative approach streams as performance, generated from sequences of memory devices: congruent layers of associations of inflection-calls evoke, through a directed scanning skyring action, point specific, melody-action strings embedded in a reference context of conventions of performance. Whew! And that's only the first sentence! Let's go on to the music...

All the pieces have a dominant improv character, quite sound-oriented. The use of the word "streams" in the subtitle might imply a continuously changing, evolving kind of music. However, though this is true in a large sense, the medium level or phrase level of the music is more terraced, as a succession of brief musical characters that hold for a time, then change to the next one. The last piece, "Bitom (stream): link" is a more harmonic, continuous stream of sound and, I think, one of the most interesting pieces of the collection, with its bowed-like sounds that cause one to wonder just how the piano is used here. The "voice"piece, "Transform (stream) monopole," is actually mostly a very airy whistling. The violin piece, "Chimanzzi (Olun): core" is quite experimental sounding. The first piano piece, "Lattice (stream): ordinal" is soloistic. It makes use of rhythmic and arhythmic repeated clusters and exhibits phase relationships. But again, what is the role of the "mechanic music instrument arrays?" Hunt plays on every piece, as soloist in three of the five. Violinist Jane Henry assists in the first piece, and Rod Stasick, voice, is heard on the second vocal piece, "Talk (slice): double," with a rather dramatic, though abstract, use of quick vocal phrases, whispered, growled, muttered, etc.

I have the feeling that a live performance of this music would be fascinating, and revealing, not only about how the sounds are made and the instruments related, but as a performance art expression of Hunt's rather esoteric approach.

In sum, I think *Ground* is interesting music to listen to for those who like to go a bit "outside" the normal "stream," but don't look for any answers about this man's particular magic unless you've got a large dictionary handy! The music, I think, stands well on its own, though, presenting in a recording of superb quality the imaginations of a quite unique person.

—TN

KEIJI HAINO: **NIJIUMU**

PSFD-7. On CD from PSF Records, 2-45-11 Matsubara, Terada Bldg. 2F, Stagaya-ku, Tokyo, Japan

My first encounter with Keiji Haino's music was an interesting, though thoroughly shocking experience. His installation set on maximum volume, he started his performance with a protracted and blood-curdling stream of screaming and roaring, charging the large room of Het Apollohius with agony. During the rest of the concert I had my ears pricked up, wary of imminent danger. This very active state of vigilance carefully scrutinized whatever Haino chose to draw from his instruments; voice and Oriental fiddle before the intermission, a variety of percussion afterwards – most of the latter metallophones, all of them played acoustically.

He made the fiddle whisper and whistle in mellifluous overtones that were audible only because of the extraordinary sound-level. Notable also was how he created the same range in volume with the percussion. He could make hand-cymbals produce a shattering ear-splitting din; but just by moving them through space and changing their position to the floor, his body or each other he made them ring and sing ever so softly.

Somehow the Japanese sense for extremes has more to do with playing on the space they encompass, than with juxtaposing them as incompatible opponents. This is certainly the case with

Haino's music. It is rich in timbres, textures and distress, mirrored by his ambiguous, androgynous appearance, too, and by his performance – resembling skirmishes during an uneasy truce in a battle of sexes within one person.

Of the two albums I heard, *Nijiumu* comes closest to this experience. The only information I have about it is that it was produced by John Zorn and that its serial number is PSFD-7. A reader of Japanese may get more out of the few characters on the cover, printed in silvery gray on black, than I do. Anyway, Haino seems to be the kind of person who will get in tune with whatever instrument he speaks through.

—RvP

FRANCISCO LÓPEZ AND JORGE REYES: **UAISCM4: TLALOC**

On cassette from Francisco López, Apartado 2542 28080 Madrid, Spain.

Francisco Lopez often works with manipulated location recordings (see the review in EMI Vol.7 #3). On "UAISCM4: Tlaloc" he teams up with Jorge Reyes to manipulate the sounds Reyes produces on Pre-Columbian instruments.

The sound is a sort of gritty, echoey, evolving stream of simple percussive and wind instrument timbres. Despite the use of wind instruments, there is very little melodic content in this recording. It relies quite successfully on shifting textures instead, evoking some very dark, surreal images.

Strangely enough, side two of "UAISCM4: Tlaloc" is not as interesting as side one even though it is based on the same structures and timbres. This problem, however, does little to mar the otherwise remarkable sound that the collaborative efforts of López and Reyes produce for this recording.

—MH

GORDON MONAHAN: **THIS PIANO THING**

Swerve Editions GM004. On CD from Silent Records, 540 Alabama St. Suite 315, San Francisco CA 94110

When I told Gordon Monathan that my wife upon her first confrontation with the contents of this CD had asked from the kitchen if that was the neighbors closing their garage-door, he was delighted. What more need I say?

This: there are two compositions on this album – *Piano Mechanics* for solo unaltered piano, and *This Piano Thing* for solo prepared piano (I referred to the latter in my review of the "Sound Symposium 1990" tape in EMI's previous issue); the former is just as consistent in the way it bends this backbone of Western music; John Oswald was responsible for the excellent recording. From what you hear you get the idea of these two having taken up residence in the instrument. This is what a piano-centric world could boil down to.

I get this vision of chef Monahan in his kitchen preparing an orchestra.

—RvP

TOM NUNN: **PLATE TECHPHONICS**

On cassette from Tom Nunn, 3016 25th St., San Francisco, CA 94110.

Tom Nunn appears regularly in the pages of EMI with his numerous electro-acoustic sound boards. "Plate Techphonics" is a truly remarkable display of the sounds produced by his instruments brought together in solo improvisation.

The range of sounds produced by these instruments is absolutely remarkable. Bobbing around in the loosely structured pieces are assorted xylophone-like sounds, arcing metallic peels, abrasive rubbing, gentle swells of pitches, and percussive splashes. The instruments in this recording are electronically processed but they never take on the echoey, muddy processed sound that often mars similar musicians' work.

All of the pieces on "Plate Techphonics" are complex sound collages that twist and evolve in fascinating ways. They are similar to the works Tom has done with his group, Rotodoti, except that they are more subtle and (I cringe to use this word) minimalistic.

As a member of Rotodoti or as a solo artist, Tom Nunn is a brilliant instrument designer and an insightful musician. His pastel textures and breathtaking array of timbres need to be heard to be believed.

—MH

PAUL PANHUYSEN: **ENGINES IN POWER AND LOVE**
Apollo Records ACD 01910

PAUL PANHUYSEN: **SINGING THE WORLD INTO EXISTENCE**
Apollo Records ACD 039212

MACIUNAS ENSEMBLE: **NUMBER MADE AUDIBLE**
Apollo Records ACD 039211

On CD from Het Apollohuis, Tongelresestraat 81, 5631 DB Eindhoven, The Netherlands

The last line in a quotation from George Maciunas printed with *Number Made Audible* reads, "he must demonstrate that anything can be art and anyone can do it". The "he" referred to is the artist in general. (Mind, this does not state that everything is art – a significant difference.) It is the motto of Paul Panhuysen's ensemble, named after the man who initiated Fluxus: a movement at once tongue-in-cheek, serious, innovative and dilettantish.

The connection is appropriate. In Panhuysen's view art is not there to provide a searching humanity with answers; on the contrary, it is an excellent medium for defining questions. It can ask, "what are you looking at", "what are you listening to", "why do you do what you are doing", and "what does that mean to you?" – all in the widest conceivable sense, of course. It celebrates curiosity, defies stiff regulation and convention. It is investigative, but not in an academic sense.

These CDs present different projects and groups of Paul Panhuysen in which sound is one (though not the only) focal point of the activities. The Maciunas Ensemble starts from a rule or a set of rules for each piece. These may involve a special technique of playing or recording, but also the use of specially designed instruments such as the Flexitar, discussed by him and Mario Van Horrik in EMI Volume VII, #1. A long steel string (with a rubber band and a piezo pickup) connects the strings of electric guitars to the ceiling of a room. In concert the musicians may come up sideways and start rocking to and fro, loosening and tightening the tension in the long string to get the maximum sound-effect from the setup: chords rising and falling along inconsolable glissandi. The action and the music are inseparable, making up a total image, one that is as inevitable as it looks droll. There's more to it though. The quartet doesn't play melodies; there is no display at all of anything even remotely reminiscent of technical skill – and yet going around the room is an abundance of music and more instruments than the eye can see: keyboards, voices and beautiful clear sounds condensing, it seems, from thin air.

Most of these aspects also appear in the other CDs. *Engines in Power and Love* is the registration of a project Panhuysen carried out with amplified dot matrix printers connected to sound effects pedals. It was performed and recorded in an office of "Research voor Belied" in Lelden, a Dutch company that evaluates consequences of government

policy; a continuous production of reports creates an environment there full of the repetitious and monotonous din characteristic of printers. With the pedals Panhuysen zooms in on specific elements of the generated sound and then modifies them. Just as with the Maciunas Ensemble, he addresses different levels of perception at the same time: one can float along with the meditative quality of the drones, one can enter on a voyage of discovery through undulations interspersed with eerie grumblings and persistent hop-skip & jumps, and yet be aware that these are common tools noted for their rather assertive sonic presence.

The latest development in Paul Panhuysen's work has been the formation of the KenaryGrandBand, based on the interplay of man and birds on an individual and equal footing. In installations (of which the most elaborate to date was built in the Exploratorium, San Francisco) he creates an atmosphere that invites the canaries to display their abilities; maybe it's best described as an interface – he establishes common ground for man and bird to communicate. *Singing the World into Existence* documents several approaches to achieve this: real-time processing of their sounds with sound effects pedals, offering them extraneous sounds (such as his own Automatic Ukulele Orchestra and Akio Suzuki's music), or just their own company in a hospitable setting. The overall result is one of freshness and openness. It goes beyond both regular art and birdsong records. As far as I know, this is the first to cover birds as social beings, and the first to present "interspecies music" in which real interchange between both species is evident. I wouldn't know what else to call this type of collaboration than a band. The birds are autonomous members, rather than the artist's instruments.

Different though these CDs may seem, they spring from one and the same motivation: the aim to show people that an imaginative attitude towards their life and surroundings is possible. A spark of hope in times of desolation.

— RvP

DAN SENN: **MUSIC AND TEXTS BY DAN SENN**

On CD from Newsense Intermedium, 1933 Commerce #301, Tacoma, WA 98402

Music and Texts by Dan Senn presents a fascinating approach to electroacoustic/electronic music (electroacoustic in origin, often electronic in sound). Four curious solo speaking voice pieces provide a contrast to the predominantly abstract music. A fascination with phase relationships, amplified found objects, feedback systems and sampled sounds is apparent. Much of the music is continuous and apparently related to precomposed processes, though the actual realization may be improvisatory. One piece in particular ("Late Takes") breaks with this character being more angular, almost pointillistic in nature, using a sampler (likely realized on keyboard), and – get this – audience-thrown coins!

Senn has invented what he calls Scrapercussion, essentially assemblages of resonant found objects that are connected via threaded steel rods and nylon lines, and supported by a frame of PVC pipe. Some of the objects ("scraps") also have output transducers which feed the instrument's own signal back into itself, creating a feedback system that can be controlled manually or by computer. Each Scrapercussion is unique in makeup and design, and undoubtedly requires its own playing techniques. The objects are struck, bowed or scraped to produce sound, and some of the objects can simply be twisted, turned or moved in some way creating friction and stretch in the nylon lines that also produce sound. There is a level of interest in wondering which sounds are being produced by which objects. The timbral palette of Scrapercussion (e.g., the Shmoos Harp and Scrapercussion #7) is rich and varied. I would love to see a live performance on these instruments, as I can only imagine how much the movements of the players would add to the overall musical impression.

A concept underlying Dan Senn's music and instrumentation is "nonlinearity", essentially implying unpredictability, nonscalar pitch sequences, and a musical character that springs directly from the specific instrument. Senn believes the nolinear instrument *is* the musical composition or score, since its uniqueness, rather than a separate abstract system, accounts so much for the character of the music it produces. In a sense, it is a "participant" in the music. I couldn't agree more! For an in depth explanation of this, the reader should refer to Senn's two-part article in this and the coming issue of EMI. Unfortunately, there are no liner notes or text to accompany the cassette, other than titles and instrumentation of the pieces, to explain anything about the music or the instruments.

I think it's safe to say that if cats would buy Whiskas, electronic and electroacoustic music junkies would buy *Music and Texts* by Dan Senn.

—TN

BILL SETHARES: **SEQUENCES AND CONSEQUENCES**

On cassette from Rivendale Studios, 622 N. Henry Street, Madison, WI 53703.

"Sequences and Consequences" is a tape of songs that explore uncommon tunings and rhythmic concepts on various instruments including synthesizers, guitars, drum machine, pan flutes, plastic saxophone, percussion, "violin-uke", and voice. For those people who find non-Western tunings to be difficult listening this tape may be an interesting pathway into less familiar territory. Despite (or because of) Bill's use of unusual harmonic and rhythmic structures he manages to construct songs that often sound more like American folk music than like the dissonant, detuned chaos that is often the result of this sort of experimentation. (Not that there is anything wrong with dissonant chaos, mind you).

Blues, just intonation, and ancient Greek scales all appear in various form throughout "Sequences and Consequences" where an octave can be found broken into 17 or 19 parts and where 12 note equal tempered notes are harmonized by notes chosen from a 19 tone scale.

Obviously, unusual tunings create tonal situations that don't appear in traditional Western music. These new situations give rise to various unique musical structures and are the heart of Bill Sethares' work. His ability to use these strange tonal "consequences" to create very familiar, comfortable music is remarkable and demands repeated listenings from anyone who is willing to venture beyond the logistics of the Western tuning system.

—MH

Recordings for review may be sent to EMI at PO Box 784, Nicasio CA 94946, or directly to the reviewers: René van Peer, Bachlaan 786, 5011 BS, Tilburg, Holland; or Tom Nunn, 3016 25th St., San Francisco, CA 94110, USA.

WIRELESS IMAGINATION
Sound, Radio, and the Avant-Garde

Douglas Kahn & Gregory Whitehead, editors

Published in 1992 by MIT Press, 55 Hayward Street, Cambridge, MA 02142. $35.

Reviewed by Bart Hopkin

Wireless Imagination is about the possibilities for sound-art outside of music. Douglas Kahn and Gregory Whitehead have gathered a collection of essays by eleven contemporary authors on explorations in art and sound, augmented by translations of five earlier seminal writings in the field. The book is intended as an initial step toward the development of a body of aesthetic criticism, independent of the existing tradition of music scholarship, in the field of sound. Its orientation is historical and analytical. In this respect it differs from Dan Lander & Micah Lexier's recently-published collection *Sound by Artists* [Art Metropole, Alberta, 1990; reviewed in EMI Vol. VII #5, April 1992], which contains sound artist's essays reflecting their own current work and thinking.

The essays in *Wireless Imagination* cover a seemingly disparate range of topics. In the absence of a coherent historical tradition in sound art, the editors made it their business to present essays highlighting a range of times and places, aesthetic movements and individuals, selected to provide some sense of the possible directions that explorations in sound-based aesthetics can take and have taken. To this end, they have included discussions of poetics and text work, conceptual works, theater works, and purely theoretical writings, as well as some material conceived within a musical context (albeit stretched & expanded). The time periods of the subjects addressed range from the later 19th century to about 1960 (the editors mention the possibility of a volume to follow focussing on the period after 1960). Essay topics include, among others, sound in early surrealism, Russian sound creation 1910-1930, German Horspiel (radio plays), and the individual contributions of Raymond Roussel, Marcel Duchamp, Antonin Artaud, John Cage and William Borroughs. Radio, phonograph and related technologies figure prominently throughout.

If the disparate subject matters make for a seemingly far-flung collection, Douglas Kahn's introductory essay, "Histories of Sound Once Removed" frames a set of overarching issues. While Kahn's concerns need not be seen as the definitive questions in the development of non-musical sound art, they provide a cohesive editorial perspective on the essays that follow. Further, they comprise an intriguing and challenging set of questions and observations. For instance:

Kahn speaks of the need for a history of sound art, meaning a body of scholarship documenting its development and manifestations. But he also talks of the need for a "non-history" – that is, "an investigation of what could have happened but didn't. ... Given developments within the avant-garde as a whole, given certain discursive, technological, and institutional conditions, why didn't certain practices ensue? ... The fact that artists did not take advantage of the new possibilities presented by optical sound film, phonography, and archives of recorded sound stands as a source of bewilderment ..."

Similarly thought-provoking is Kahn's discussion of "the privileging of music as the art of sound in modern Western culture." Music, as it is generally perceived, involves manipulation of an artificially restricted set of sound parameters in pursuit of aesthetic effect. There's nothing wrong with that of course – art forms are free to develop in whatever directions they may – but why, then, should music be treated as if it were the definition of sound art; why should the relatively narrow manifestations of music be accorded an extensive scholarly tradition, while the possibility of a sound art outside the musical manipulation of pitch and rhythm goes largely unheeded? Kahn goes on to observe, "Even this century's most noted radical attacks upon music – conducted, as they were, under the sign of noise and sound – ultimately returned to music. Luigi Russolo's 'art of noises' was recuperated immediately into the goal of 'a great renovation of music'; Edgar Varèse's 'liberation of sound' was a motto of retreat when compared to Russolo's position; and at the core of John Cage's emancipatory project was a will to impose musical precepts upon all sounds."

Delving beyond Douglas Kahn's introductory essay, perhaps the most interesting piece here for people interested in musical and extra- musical sound sources will be Mel Gordon's "Sounds from the Museum of the Future: Russian Sound Creation (1910 - 1930)." It touches on, among other things, noise orchestras, music machines, color organs, and microtonality. Following the essay are original technical notes by Arseni Avraamov (translated from the Russian by Mel Gordan) for his famous *Symphony of Factory Sirens* presented at Baku and Moscow in 1922 and '23.

Coming at a time when we have been seeing a great deal of deferential writing about John Cage, Frances Dyson's essay, "The Ear That Would Hear Sounds in Themselves", provides clear-eyed angles on Cage's irridescent pronouncements regarding sound and music as his thinking evolved with circumstance.

Mark Cory's "Soundplay: The Polyphonous Tradition of German Radio Art" is about *Hörspiel*, the highly-developed genre of German radio plays. *Hörspiel* has been primarily a dramatic form, but Cory's discussion is in many ways the sort of *nonhistory* called for in Kahn's introductory essay. In this connection, it is full of interesting observations and quotes on the nature of sound aesthetics and the potential for an independent art of sounds.

And, of course, there's much more to be found in the remaining essays as well. For people inclined to a nuts-and-bolts, hands-on style, this book will be too abstract, too scholarly. For people interested in modern intellectual history and the contemporary implications thereof, this book will have substantial value.

MICROTONE GUIDE

by C.A. Fortuna

Published 1991 by C. Fortuna, 1305 Hartrick, Royal Oak, MI 48067. $7.50.

Reviewed by Bart Hopkin

Clem Fortuna's *Microtone Guide* is a 34-page photocopied booklet presenting tuning information for a collection of forty-plus scales. It is tailored to players of tunable synthesizers, giving them the data they need to re-tune their instruments to non-standard tunings. The information assembled here is potentially useful as well to anyone who makes or tunes instruments, especially in conjunction with an electronic tuner.

The tuning data is presented in the form of pitch deviations from the standard pitches of twelve-tone equal temperament: each pitch within each tuning is given by specifying a certain amount of de-tuning relative to one of the 12-equal pitches. That's a natural approach for synth re-tuning purposes, and it's also convenient for anyone tuning other sorts of instruments using a commercial electronic tuner. (For someone whose purpose is to study the tunings from a theoretical point of view, the appearance of the data in this form is inconvenient.)

In most of the tunings the following information is presented for each scale degree:

1) Note name for the 12-equal pitch which is to be de-tuned to arrive at the desired new pitch;

2) A plus-or-minus cents value, being the amount that the original 12-equal pitch is to be detuned. (A cent is a tuning unit equal to 1/100 of an equal-tempered semitone or 1/1200 of an octave. Electronic tuners and some synthesizer tuning mechanisms are calibrated in cents.)

3) The same deviation from the 12-equal standard pitch, expressed this time in DX7 tuning units. These are the tuning calibration units used in Yamaha's DX7 synthesizer, the most widely-used of tunable synthesizers in recent years.

4) Frequency in cycles per second.

For the non-twelve equal-temperaments given in the booklet, the information is condensed and only 1) and 2) above appear. The last page contains a cents-to-DX7-units conversion chart. Reduced frequency ratios for the just tunings are not included, but the user can derive them taking ratio of the frequency of the upper tone over that of the lower tone for any desired interval and reducing.

The booklet also has a very short introductory text, plus brief notes providing background information on each of the scales presented. Basic historical or ethnographic data is given here, including in many cases the source from which Fortuna obtained the specific tuning data. There are also notes on any special manipulations or keyboard-layout tricks he may have employed, and occasional comments on how the scale functions musically.

Scales from a wide variety of sources are included -- their diversity, and the balance that this provides, is one of the strengths of the collection. There are several derived from non-western musics including tunings based on Siamese, Indonesian, Ethiopian, Chinese, Arabic, Indian and Scottish (bagpipe) models. There are several early European tempered tunings including a meantone, the Werkmeister temperament and the Kirnberger temperament, plus Pythagorian. There are just tunings both ancient and modern, including harmonic series, standard versions of 5- and 7-limit, and Partch's monophonic, plus an exotic "arithmetic proportion" scale, being the sort of scale that would arise from equidistant spacing of frets on a string instrument. Also included are all equal temperaments from 5 to 24 tones per octave, plus the ever-popular 31. Along with these, there are Wendy Carlos' *Alpha, Beta* and *Gamma* scales, which involve equal steps that are not subdivisions of an octave, so that the scales are not octave-repeating.

For the non-western systems Fortuna used scale data from various sources to create tunings in the spirit of the underlying musical traditions. They are not to be viewed as authoritative from an ethnomusicological point of view. For some of them Fortuna has added tones to take advantage of possibilities inherent in the keyboard. In a couple of cases, he uses the white keys and the black keys separately to jointly accommodate a complementary pair of five- and seven-tone scales.

Clem Fortuna's ad that has been appearing in EMI's "Notices" column describes his *Microtone Guide* as "a good sourcebook for beginning microtonalists." That sums it up pretty well, except to add that it should be useful for not-so-beginners as well.

RECENT ARTICLES, continued from back cover

Xenharmonic Bulletin (3612 Polk Ave., San Diego CA 92104) is Ivor Darreg's vehicle for discussions of issues in tuning theory, as well as updates on his recent alternative tuning explorations and instrument building work, and musings on a variety of other topics. **Xenharmonic Bulletin** #12 (December 1992) contains discussions of higher-order equal temperaments (those with large numbers of tones per octave), slide guitars and related flexible-intonation instruments, scale relationships in telephone touch-tone frequencies, and several other subjects.

Leonardo Music Journal Volume 2 #1 (MIT Press Journals, 55 Hayward St., Cambridge, MA 02142) contains quite a few noteworthy articles. Among them:

"Elemental Counterpoint with Digital Imagery," by Brian Evans, proposes an approach for realizing musical parameters in animated visual imagery.

"Composition with Sound and Light," by Barton McLean, describes a MIDI-keyboard-operated light controller, designed to realize musical parameters in animated light patterns.

"A Personal Story of Music and Technologies," by Godfried-Willem Raes, is a review of the author's 25 years of inventive sound work. Raes' ideas are always insightful and thought-provoking. Much of the content of this essay parallels closely his earlier essay "My Work as an Instrument Maker" published in **Echo: The Images of Sound**, Paul Panhuysen, ed., 1987.

"Composing with Time-Shifted Environmental Sound," by Barry Truax, discusses the unique and revealing effects that can be realized by expanding sampled sounds in time (slowing them down) without shifting their pitch, by means of special signal processing equipment.

"Buddhist Music of Mongolia" by Peter Vähi is a collection of notes on Buddhist ritual music in Mongolia and elsewhere, including information on and photographs of several of the instruments used.

"Lyon: Musiques en Scène 1992" is a review of a music festival; the review mentions a number of sound sculptures and installations that were part of the festival.

In addition to the print journal, **Leonardo Music Journal** comes with a CD. This issue's CD, edited by Jody Diamond, is devoted to new music for Gamelan. Included are both Indonesian and American composers and performers; several of the pieces use unique instrumentation.

The following is a listing of selected articles relating to musical instruments which have appeared recently in other publications.

"An Interview with Mike Dennis: Confessions of a 'Plumber'" by Scooter Pirtle, in **The Middle Horn Leader** Volume II #2, March 1993 (PO Box 8402, Paducah, KY 42002).

Mike Dennis, interviewed here, is a musician and instrument technician with a background in drum & bugle corps, who has done a lot with modification and hybridization of brass instruments. He also has a sense of humor.

"Retuning Music" by Chris Mohr, in **On the Air** Volume IV #1, January 1993.

An introduction to microtonality, oriented to classical musicians. Includes information on modern microtonalists including both synthesist/computerists and people working with acoustic instruments.

"Sculpter un Tambour (Ouganda)", in **Percussions** #27, February 1993 (18 rue Theodore-Rousseau, F-77930 Chailly-en-Bierre, France).

Illustrated notes on drum carving in Uganda. (In French.)

"The Renaissance of the Glass Armonica" by Thomas Bloch, in **Glass Music World** Volume VII #1, January 1993 (2503 Logan Dr., Loveland, CO 80538).

Part 2 of Thomas Bloch's history of musical glasses.

"The Origins of Bottleneck Slide Guitar by Eric Madis, in **Victory Review** Volume 18 #3, March 1993 (PO Box 7515, Bonney Lake WA 98390).

A short history of bottleneck slide guitar technique.

"Elements of Style: Fred Frith's Constructive Approach" by Andrew Jones, in **Option** #49. March/April 1993 (2345 Westwood Blvd. #2, Los Angeles, CA 90064).

A wide-ranging discussion of Fred Frith's recent work, much of which involves home-made instruments and a tinkerer's approach to sound.

"Sculptures strike artistic, musical chord" by Randy Gragg, in **The Portland Oregonian**, December 18(?) 1992.

A preview, complete with a great photograph, for a concert by Gilles Foisy and Art Resnick, who make musical sculpture.

"Recording Telluric Signals II" by Gerry Vassilatos, in **The Journal of Borderland Research** Volume XLVIX #1, 1st Quarter 1993 (PO Box 84935, Garberville, CA 95542-0429).

Part 2 of a report on the monitoring & recording of electrical signals picked up from the ground using specially-designed electromagnetic pickups for conversion to audio.

"The World's Largest Drum?" in **The Music Trades** March 1993 (80 West St., PO Box 432, Englewood, NJ 07631).

A photograph, with caption, of Remo, Inc.'s Table Drum, an oversized drum intended for use in physical therapy, described as "immensely resonant."

"Frederic Le Junter," in **Logosblad** Volume 14 #12 (Kongostraat 35, 9000 Gent, Belgium).

A short report, with photographs, on self-playing sound machines made from common household materials by Frederic Le Junter. (In Dutch.)

"The music man: Musician marches to the beat of his own pots and pans" in the **Peninsula Times Tribune** Jan 11 1993 (South San Francisco Bay area, CA)

A report on junk instrument maker Herb Moore or Menlo Park California.

"Sound Travels" and "Sound Travels, Part 2" by Phil Dadson, in recent issues of **Music In New Zealand.**

Phil Dadson reports on experiences in search of new and unusual music and instruments in Pacific islands and in the U.S. Part 1 contains descriptions of music and instruments in Bali and the Solomon Islands; Part 2 describes meetings with a number of American instrument makers.

"Sound Playground: Acoustic Adventure in a New Bronx School", in **The Soundscape Newsletter** #5, March 1993 (World Soundscape Project, Dept. of Communication, Simon Frasier University, Burnaby, B.C., Canada V5A 1S6).

A short description, with three photographs, of a sound playground including a variety of playable, percussable, and shout-into-able sculptures, installed at P.S. 23 in the South Bronx by Bill and Mary Buchen.

In addition to the above, **Soundscape Newsletter** #5 (address above) contains many short items and lots of networking information for people interested in sound and environment.

"Pre-Columbian Flutes of Mesoamerica" by Richard W. Payne and John D. Hartley, in **Journal of the American Musical Instrument Society** Volume XVIII, 1992 (Shrine to Music Museum, 414 E. Clark St., Vermillion, SD 57069-2390).

A report on wind instruments from the cultures of what is now central and southern Mexico and neighboring regions. This is the same topic that Susan Rawcliffe addressed in her recent article in EMI (Volume VIII #2, December 1992). The current Payne & Hartley article is longer and contains more historical and ethnographic detail than the Rawcliffe article; it also has many excellent photographs. It offers less in the area of acoustic description and analysis, and lacks Rawcliffe's eye for the hands-on aspect of instrument making.

Other articles appearing in **Journal of the American Musical Instrument Society** Volume XVIII, 1992 (address above): "The Musical Instrument Collection of Michiel van Bolhuis (1764)" by Albert R. Rice; "Aspects of Early Keyboard Technique" by Bernard Brauchli; plus several book reviews.

The Spike Jones Musical Depreciation Newsletter is published by The Spike Jones International Fan Club (129 E. Colorado Blvd. Suite 508, Monrovia, CA 91016). Issue #18, Fall 1992, contains an article on the recent death of former musical depreciator Purves Pullen (AKA Doctor Horatio Q. Birdbath), a reprint of a 1940s article on life with Spike Jones written by his wife (surprisingly normal, she reports), and other odds and ends including information on availability of Spike Jones recordings and memorabilia.

American Lutherie #32, Winter 1992 (8222 South Park Ave., Tacoma, WA 98408) contains, among many other things, articles on a 16th century ivory lute, a factory tour of a Gibson guitar plant, and interviews with several string instrument makers.

(Continued on page 39)